THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIII. No. 1617.] LONDON, MAY 8, 1894. [46TH YEAR. PRICE 6d.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works
(also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

WOLSTON'S
TORBAY PAINTS
Special Quotations to Gas Companies.
DARTMOUTH, DEVON.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL
AND GAS COALS.
Quotations and Analysis on application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD
LONDON.

Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.

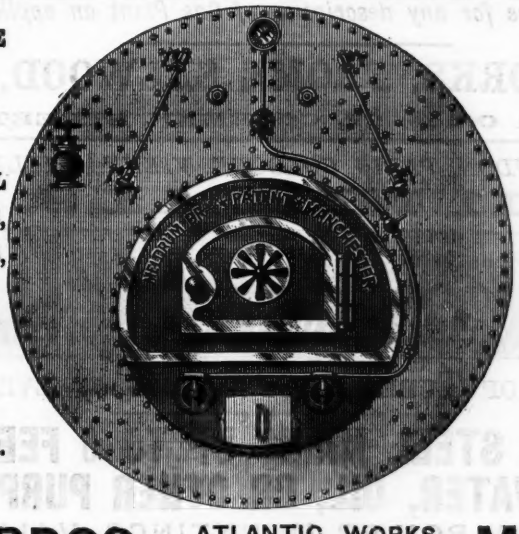
See Advt. p. 823, of this week's issue.

NORTON'S PATENT
"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 125, BUNHILL ROW, LONDON, E.C.

DUST-FUEL FURNACE
(MELDRUM'S PATENT).

BURNS ANY KIND OF WASTE FUEL TO ADVANTAGE.

SUPPLIED to the PRINCIPAL GAS-WORKS, WATER-WORKS, ELECTRIC LIGHT STATIONS, &c., &c.



OVER
1800
WORKING.

LONDON OFFICE:
16, UNION COURT,
OLD BROAD STREET, E.C.
WILLIAM BOBY, Agent.

MELDRUM BROS., ATLANTIC WORKS, 13, CITY ROAD, **MANCHESTER.**
Telegrams: "MELDRUM, MANCHESTER." *National Telephone No. 1674.*

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

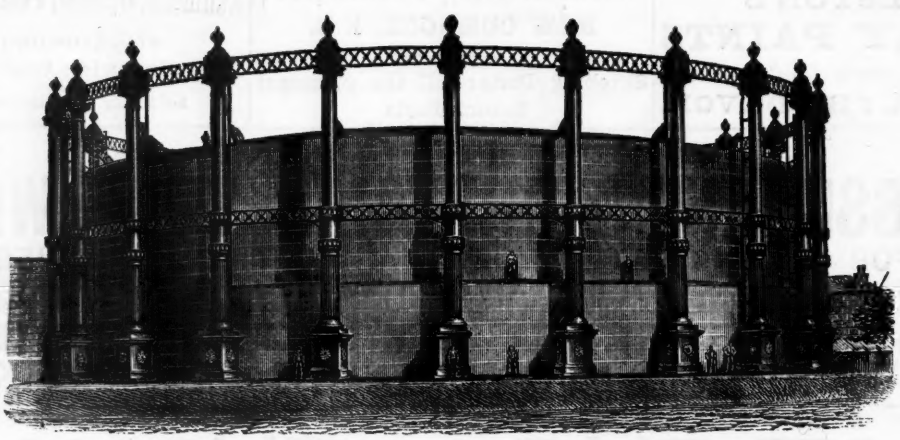
TELEGRAPHIC ADDRESS: "COCKEY'S FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS,

Manufacturers of GASHOLDERS and TANKS, BOILERS and ENGINES, ROOFS, EXHAUSTERS, BREEZE SCREENS, CHARGING and COKE BARROWS.



Manufacturers of PATENT WASHERS, PATENT VALVES for PURIFIERS, &c., GOVERNORS, LAMP COLUMNS, Weighbridges, COKE BREAKERS.

MAKERS OF FISH & SMITH'S PATENT (NO. 5108) OVERFLOWS FOR REGULATING THE SEAL IN GAS-WASHERS, &c., AND COCKEY & SMITH'S PATENT SELF-ACTING BYE-PASS VALVES.

Estimates for any description of Gas Plant on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

London Office: 22, COLEMAN STREET, E.C.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

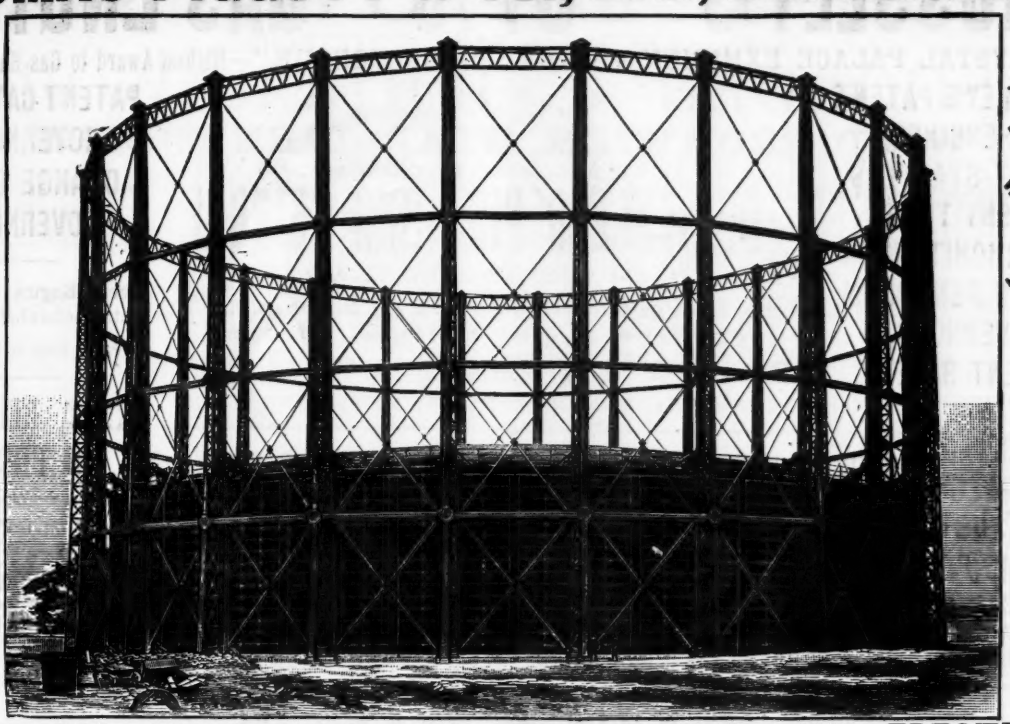
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street.
BIRMINGHAM: 114, Colmore Row.
LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, WROUGHT & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

GAS COAL.

BEST

REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

Near BARNSLEY, SOUTH YORKSHIRE.

NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS of all sizes.

GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description,

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

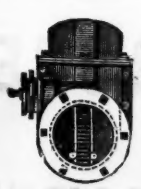
WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS,

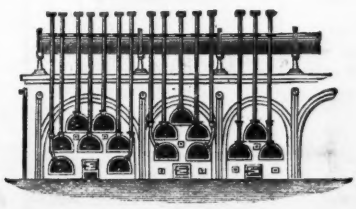
TAR AND LIQUOR PUMPS, &c.

PATENT CENTRE-VALVES

for working Purifiers,

Also Bye-Pass & Stop Valves.



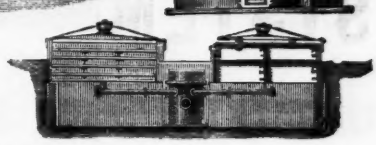


PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

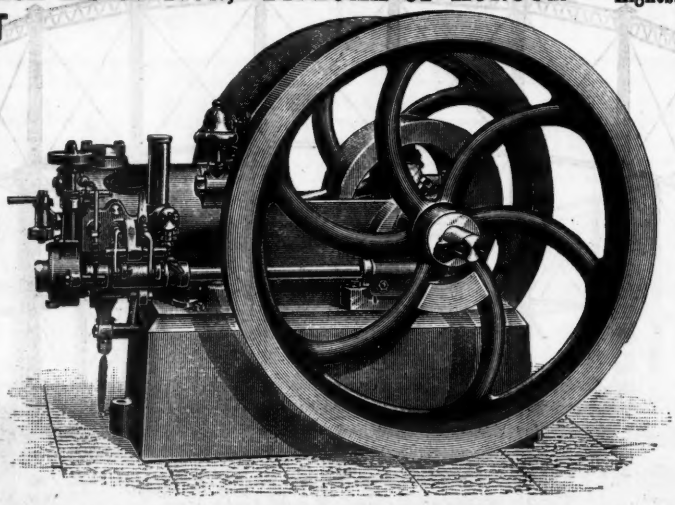
Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

CRYSTAL PALACE EXHIBITION, "DIPLOMA OF HONOUR"—Highest Award to Gas-Engines.

CROSSLEY'S PATENT OIL-ENGINES, PATENT STARTERS, PATENT TUBES FOR IGNITION, PATENT PENDULUM GOVERNORS, PATENT SAFETY HANDLES, PATENT TIMERS, PATENT ANTI-FLUCTUATING GAS-BAGS.



PATENT CATARACT GOVERNORS, CHANGE SPEED GOVERNORS.

Every Engine thoroughly tested before being sent out

ALL PARTS MADE STRICTLY TO GAUGE

GREAT REDUCTION IN PRICES.

OVER 800 ENGINES ALWAYS IN HAND.

CROSSLEY'S NEW HIGH-SPEED ENGINE FOR DIRECT ELECTRIC LIGHTING.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND.

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

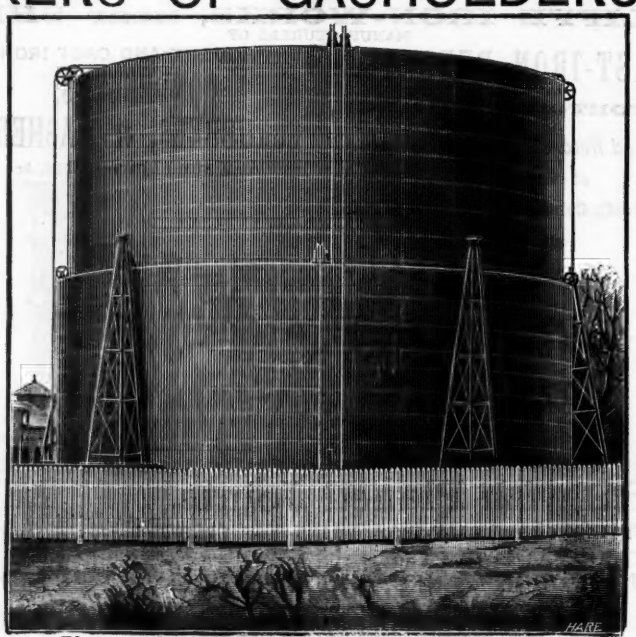
GLAZED BRICKS AND PORCELAIN BATHS.

ASHMORE, BENSON, PEASE, & CO., LIMITED,

GAS-WORKS CONTRACTORS, STOCKTON-ON-TEES.

SOLE MAKERS OF GASHOLDERS ON THE

WIRE ROPE SYSTEM



WIRE ROPE SYSTEM

This Engraving is taken from a Photograph of a Holder **increased in capacity from 32,000 cubic feet to 59,000 cubic feet** by the addition of a Lift. The Ropes are applied to both Lifts to supplement the Standards.

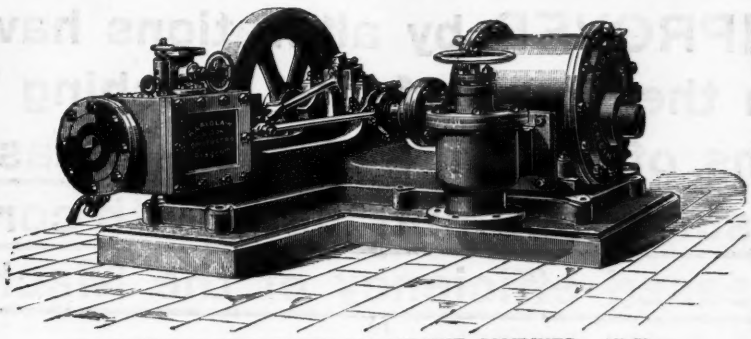
LONDON OFFICE: 15, VICTORIA STREET, S.W.

R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

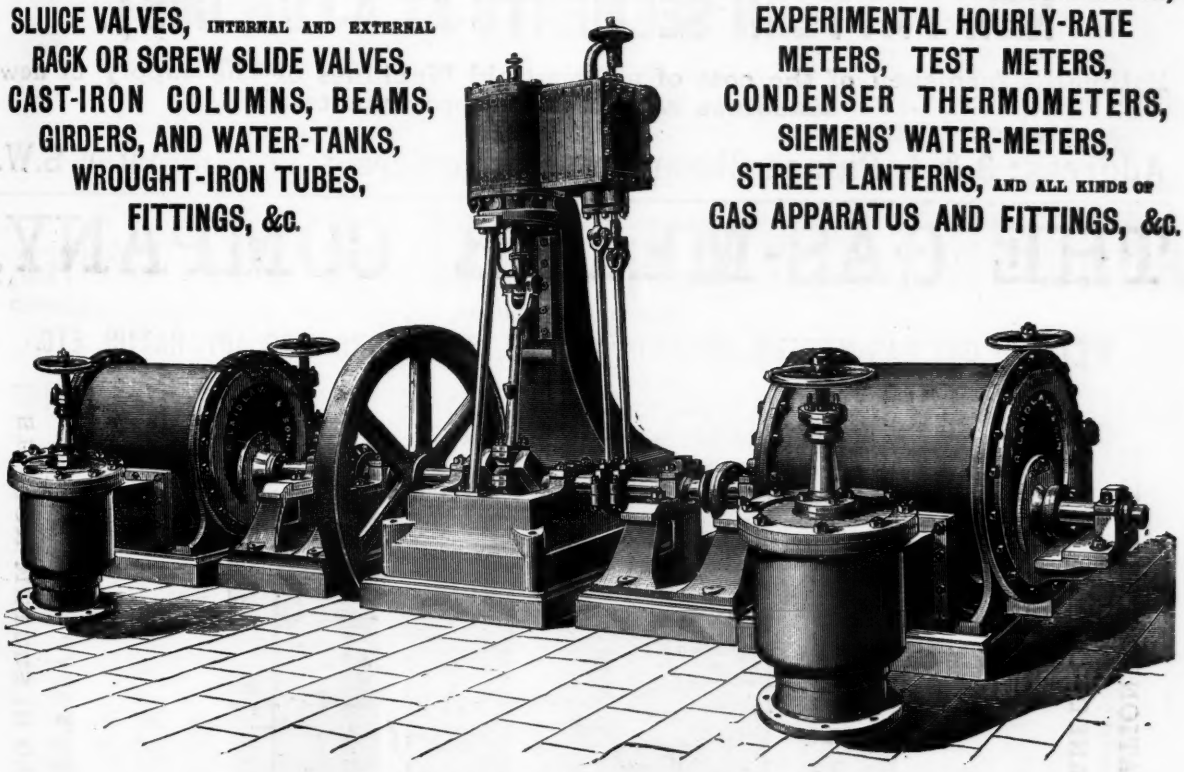
Manufacturers of GAS APPARATUS of every Description.

Makers in Glasgow of
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING-ENGINES For Water-Works.
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES, INTERNAL AND EXTERNAL
RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS, BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



BEALE'S GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.

Makers in Edinburgh of
WET AND DRY GAS-METERS, IMPROVED
STATION GOVERNORS,
PRESSURE REGISTERS
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS, TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS, AND ALL KINDS OF
GAS APPARATUS AND FITTINGS, &c.



BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,

INTERNATIONAL EXHIBITION, EDINBURGH 1886.

ALLIANCE FOUNDRY, GLASGOW. | SIMON SQUARE WORKS, EDINBURGH. | 6, LITTLE BUSH LANE, LONDON, E.C.

KIRKHAM, HULETT, & CHANDLER, Limited

PATENT

"STANDARD" WASHER-SCRUBBERS

These Washer-Scrubbers have recently been IMPROVED by alterations having been made in the form of the Washing Devices, by means of which a great increase in the wetted surface is obtained, with corresponding increased efficiency of the Machines.

OLD PATTERN MACHINES CAN BE FITTED WITH THE NEW PATTERN SEGMENTS AT A LOW COST.

Estimates furnished of the cost of altering old Machines or the supply of new Machines with latest improvements.

Address: 3 & 4, Palace Chambers, Bridge Street, Westminster, S.W.

THE GAS-METER COMPANY, LIMITED

MANUFACTURERS OF

WET AND DRY GAS-METERS STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.

STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM, Late WEST & GREGSON. Established 1830.

For Prices and Particulars apply to

R. L. ANDREWS, General Manager.

Works: 238 KINGSLAND ROAD LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

(See Advertisement on back of Wrapper.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

TELEGRAPHIC ADDRESS:
"ROBUSTNESS LONDON."

GAS & WATER
WORK
J. & H. ROBUS,
ENGINEERS & CONTRACTORS,
20, BUCKLERSBURY, LONDON, E.C.,

furnish Plans, Estimates, and Specifications for SINKING BOREHOLES *and* WELLS; *Erecting* RESERVOIRS, FILTER-BEDS, *and* GASHOLDER TANKS; *and* EVERY REQUISITE *for* GAS *and* WATER WORKS,

INCLUDING

MAIN LAYING

EXCHANGE TELEPHONE 1756.

GAS AND WATER PIPES.

Telegraphic Address: "RITCHIE MIDDLESBROUGH."

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES. and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.
LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

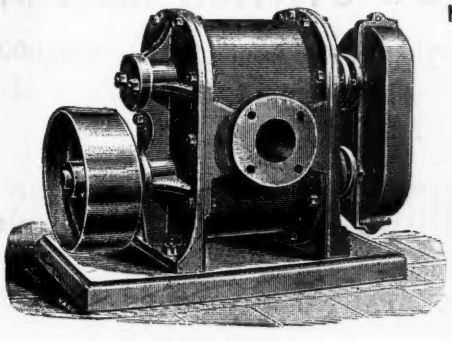
JOHNSON'S PATENT

DRUM PUMP AND GAS EXHAUSTER.

The Pump of the future for quickly and economically moving large bodies of Water, Semi-Fluids, &c.

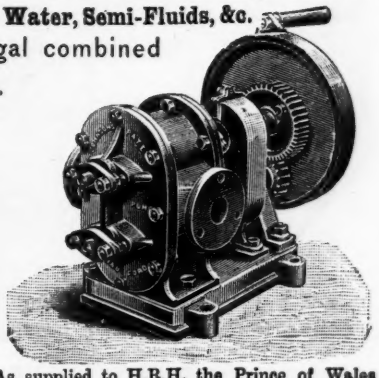
The force of the Piston Pump with the capacity of the Centrifugal combined

NO SLIDES OR FRICTIONAL WORKING PARTS.



NO PRIMING.

NO VALVES.



As supplied to H.R.H. the Prince of Wales for Pumping Gas Liquor at his Sandringham Gas-Works.

DRUM ENGINEERING COMPANY,

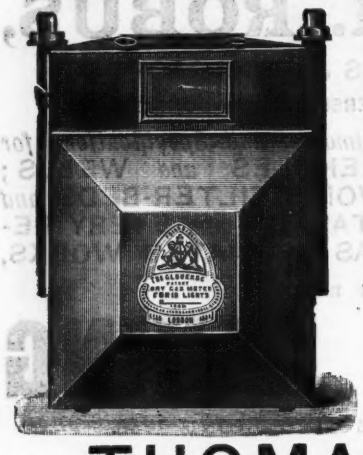
Hydraulic and Pneumatic Engineers, 55, ATHOL ROAD, BRADFORD.

[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.

Telegraphic Address: "GOTHIC LONDON."
Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

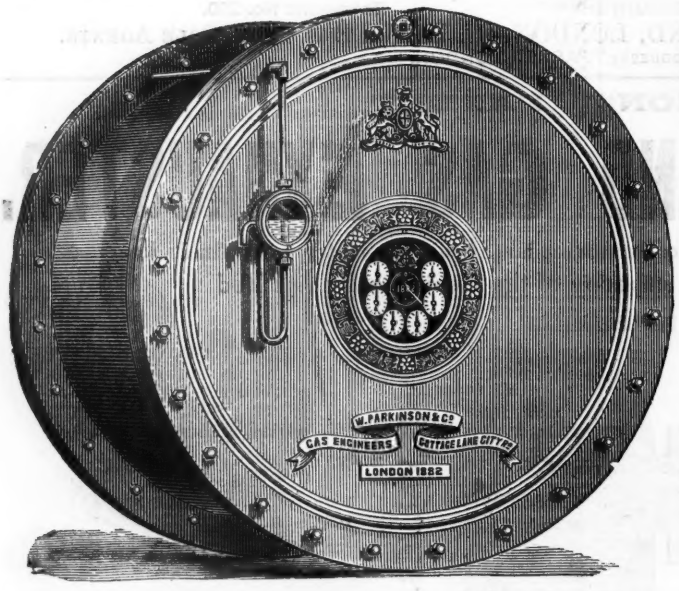
BRISTOL: 62, VICTORIA STREET. *Telegraphic Address*: "GOTHIC."

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address*: "GOTHIC."

LEEDS: BOAR LANE CHAMBERS, 4, BASINGHALL STREET. *Telegraphic Address*: "GOTHIC."

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address*: "GOTHIC."

W. PARKINSON & CO.



STATION METERS

IN

ROUND or SQUARE TANKS.

500 STATION METERS,

Varying in size from **1200** to **250,000** cubic feet per hour, have been sold, fitted with

THREE-PARTITION DRUMS.

DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS.

COTTAGE LANE WORKS, CITY ROAD, **LONDON.** Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS, **BIRMINGHAM.** Telegraphic Address: "GAS-METERS."

10, MAWSON'S CHAMBERS, DEANSGATE, **MANCHESTER.** Telegraphic Address: "PRECISION."

CONTENTS.

EDITORIAL NOTES:—

PAGE

GAS, LIGHTING, &c.—
Carburetted Water Gas up to Date . . . 833
The Falkirk Gas Bills in Committee . . . 834
The North of England Association Meeting . . . 834
An Improved Atmospheric Gas-Burner . . . 834
Labour Commission Reports . . . 835

WATER AND SANITARY AFFAIRS—
The West Middlesex and Southwark and Vauxhall Water Companies' Bills in Committee—The Meeting of the West Middlesex Water Company . . . 835

ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market . . . 836
Electric Lighting Memoranda . . . 836
The Sanitary Equality of Gas and Electric Lighting . . . 837

COMMUNICATED ARTICLE:—
The Development of the Gasholder. By A. M'I. Cleland. Third Article 839

TECHNICAL RECORD:—
North of England Gas Managers' Association—
General Business . . . 841
Paper by Mr. H. Lees on "Gas Undertakings in Relation to the Use of Gas-Engines" . . . 843
Ohio (U.S.A.) Gaslight Association—Annual Meeting at Columbus . . . 841

REGISTER OF PATENTS:—
Converting Coal Tar into Illuminating Gas—Smith, J. . . . 846
Gas Power Motors—Wilkinson, G. . . . 846
Prepayment Gas-Meters—Hawkyard, J., and Braddock, J. . . . 846
Gas-Motor Engines—Peebles, D. B. . . . 847
Atmospheric Gas-Burners—Volsey, C. B., and Stevenson, W. . . . 847
Regenerative Gas-Burners—Lake, H. H. (Swift, W. R.) . . . 848
Gas-Governors—Horton, J. . . . 848
Patent Notices . . . 848

CORRESPONDENCE:—
An Improvement in Burners for Gas-Fires . . . 848
The Yeadon Revolving Retort . . . 849
Gas as a Fuel . . . 849

PARLIAMENTARY INTELLIGENCE:—
House of Lords—Progress of Bills . . . 850
House of Commons—Progress of Bills . . . 850
House of Lords Committees—
Falkirk Corporation Gas Bill; Falkirk and District Gas Bill . . . 850
Newcastle and Gateshead Water Bill . . . 852
House of Commons Committee—West Middlesex Water Bill . . . 853

LEGAL INTELLIGENCE:—
High Court of Justice—Queen's Bench Division—Yeadon Water-Works Company *v.* Binns and Another . . . 855
High Court of Justice—Chancery Division—Halifax Corporation *v.* Morley Corporation—A Question of Encroachment on Water Supply Districts . . . 855

MISCELLANEOUS:—
Meeting of the Imperial Continental Gas Association . . . 858
Meeting of the Bombay Gas Company, Limited . . . 859
Meeting of the Singapore Gas Company, Limited . . . 859
Meeting of the West Middlesex Water-Works Company . . . 860
Manchester Corporation Gas Supply—The Noxious Vapours Abatement Association and the Price of Gas . . . 861
Rotherham Corporation Gas and Water Supply—Annual Financial Statements . . . 861
Bolton Corporation Gas Supply—The Accounts for the Past Financial Year . . . 861
Notes from Scotland . . . 862
Current Sales of Gas Products . . . 863
Coal Trade Reports . . . 863
Gas and Water Companies' Stock and Share List . . . 864

PARAGRAPHS.—The Manchester Gas Committee's Estimates, 835—Gas Undertakings Returns, 836—Institution of Civil Engineers, 836—Death of Mr. G. Ridley, 836—Mr. James M. Veevers, 836—Death of Herr Mannesmann, 836—Discoveries of Coal in Durham, 836—Water-Gas Manufacture in England, 836—Presentation to Mr. W. W. Parkinson, 836—The Managership of the Elswick Gas-Works, 836—Mr. Jonathan Noden, 838—Retirement of an Old Official of the Liverpool Corporation Water Department, 838—Wooden Water-Mains, 838—The Royal Society's Conversazione, 838—A Statue of M. Durand-Claye, 840—The Flow of Water through New Cast-Iron Pipe, 844—The Electrolysis of Gas and Water Pipes, 844—Effect of Heat on Lead Pipes, 845—Explosive Mixtures of Ethane and Oxygen, 845—Units of Light, 845—An Unprofitable Half Year for the Ilkeston Corporation Gas Department, 848—The Electric Lighting Scheme for Bradford Out-Townships, 849—Gas Workers' Hours at Rotherham, 849—The Finances of the Rotherham Corporation Gas and Water Departments, 849—Important Extensions at the Wolverhampton Gas-Works, 849—The Gas and Water Accounts of the Clitheroe Corporation, 849—Payment of Wages during Illness, 849—A Heavy Sentence for Stealing Gas, 854—The Bury Corporation and the Supply of Water to Haslingden, 854—Harrow and Stanmore Gas Bill, 854—Sales of Shares, 854—Electric Lighting at Derby, 857—Baildon New Water-Works, 857—Manchester Corporation Water-Works, 857—Newport Pagnell Gas and Coke Company, Limited, 861—Bolton Corporation Water Supply, 862—Gas Supply in Constantinople, 862—Closing of a Coal Pit in South Yorkshire, 862—The Public Lighting Dispute at Liverpool, 862—The New Water-Works for Wakefield, 862—The Wrexham Corporation and the Electric Light, 863—The Profits of the Stockton Gas-Works, 863—Water-Works for St. Austell, 863—Georgetown (British Guiana) Gas Company, Limited, 863—The Stockport Corporation Provisional Order, 863—The Finances of the Rochdale Corporation Gas and Water Committees, 863—Gas Supply in the Midlands, 864—Lincoln Corporation Water Department, 864—The Electric Lighting Question at Folkestone, 864—Critical Condition of the Leicester Water Supply, 864—Norwich Electricity Supply Company, Limited, 864—Gas *v.* Electric Lighting in the City Streets, 864—Exhibitions of Gas Appliances, 864—Cleobury Mortimer Gas Company, Limited, 864—Danger of Contamination of the Chalk Areas in Surrey, 864.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MAY 8, 1894.

Carburetted Water Gas Up to Date.

In next week's JOURNAL we hope to publish a statement which has been supplied to us by Messrs. Humphreys and Glasgow, setting forth the results of their experience of several years in the practical introduction of plant for the manufacture of carburetted water gas in the United Kingdom. This communication is intended by the authors to serve as a reply to our article entitled "Information Wanted" which appeared in the issue of the JOURNAL for Dec. 6, 1892. There has been no unseemly haste in producing this answer; but Messrs. Humphreys and Glasgow are to be praised rather than blamed for waiting until they could point to the results of their European experience as supplementing their previous American successes. When these energetic American gas engineers first came among us, it was on the strength of the position acquired in the United States by the United Gas Improvement Company of Philadelphia, who were the proprietors of the Lowe patented system of manufacturing carburetted water gas. They believed that there was enough in this system, susceptible as it was of numberless modifications, to make it popular alike with British and European gas managers. They accordingly set to work to introduce it here strictly upon its merits; for there was no British master-patent to protect the Lowe type of apparatus. It is not our business to tell the story of the adventure, regarded as a private speculation, from the day when the first improved Lowe gas generator was set up in England to the present time. It is no secret, however, that the specialists who were committed to the experiment soon discovered that they had to deal in this country with materials and working conditions differing widely from those to which they had been accustomed at home; and it was uphill work to adapt themselves and their apparatus to European requirements. They now claim that this has been done; and they accordingly pledge their professional reputation for the reliability and sufficiency of the results they are able to adduce. We owe Messrs. Humphreys and Glasgow this notice of their deferred statement, because our past references to the carburetted water-gas propaganda in the United Kingdom have been read as reflecting upon the completeness of their equipment for the task they set themselves to perform. It is but fair to Messrs Humphreys and Glasgow to admit that they took in good part our expressions upon this head. They did not show "temper," much less institute an action for libel upon the ground that we held their claims "not proven" at the end of 1892. We have consequently a particular pleasure in making the *amende* of giving their justification as much prominence as was accorded to our inquiry as to what they were doing some eighteen months ago.

It is unnecessary to go over the old ground of the reasons why carburetted water gas generally, and the systems favoured by the United Gas Improvement Company in particular, have "boomed" in the United States. The most pertinent argument for the merits of carburetted water gas that can be based upon this fact of its technical history is that a class of gas-making apparatus so extensively used under widely varying conditions must possess a high degree of reliability and efficiency. Such a system must have credentials which only need correction for local conditions to meet any possible set of circumstances. To these credentials Messrs. Humphreys and Glasgow are justified in pointing as establishing a *primâ facie* case for their type of gas-producing apparatus. They classify them under nine heads—beginning with economy of ground space, and ending with practical independence of labour. But we have no room here for discussing claims with which all readers of water-gas literature are familiar. The crucial question is: What does carburetted water gas cost on the average, taking English prices into account? Messrs. Humphreys and Glasgow state that their 24-candle gas can be made for 1s. 5d. per 1000 cubic feet, or after the rate of 0·207d. per pound of sperm. In this estimate, oil is reckoned at $3\frac{3}{8}$ gallons, at $2\frac{3}{4}$d. per gallon; coke (including boiler fuel), 45 lbs., at 12s. per ton; labour, at $1\frac{1}{2}$d.; purification materials, at $\frac{1}{2}$d.; repairs and maintenance, at 1·3d.; water, at 0·2d.; and superintendence, at $\frac{1}{2}$d. per 1000 cubic feet. No credit is taken for the oil tar recovered, which is, at any rate, capable of replacing from 5 to 8 lbs. of fuel; and there is no allowance for cost of capital. With these reservations, the statement is put forward as covering the entire cost of the gas in the holders, when made in quantities approximating to half a million cubic feet per diem, with a probable margin of safety of at least 1d. per 1000 cubic feet. This statement is made upon Messrs. Humphreys and Glasgow's own authority, supported by reference to the water-gas practice of The Gaslight and Coke Company, who are asserted to make, with plant somewhat

inferior in certain points to apparatus of the latest design, 12 million cubic feet of carburetted water gas daily, at an average cost of about 0·210d. per pound of sperm. These figures are therefore to be taken as the last word of those responsible for the pattern of carburetted water-gas plant most in use at the present time in the United Kingdom. But it is the starting-point for every suggested improved system. The proportion of carbonic oxide in the purified gas is not given.

The cost of oil is still the governing factor in the problem of making carburetted water gas at a possible prime cost into the holder. The estimated price here given of 2¾d. per gallon is not out of the way; for we believe that Russian oil very suitable for gas making has been bought in London even cheaper, and there is not much fear of the supply giving out. With some commodities, increased demand raises the market value; while with others, the same influence lowers it. The former effect is produced when the supply is limited; the latter, when it is practically unlimited. It is pretty well established that the Russian oil-fields already opened up are, to all intents and purposes, inexhaustible; while fresh ones are only waiting to be similarly developed. Some interesting information bearing upon this subject was recently published upon the authority of Mr. Chambers, the United States Consul at Batoum, who is of opinion that only the laying of a pipe-line from the oil-fields to the sea is required to enable the Russian product to swamp the American, even at home. Refined petroleum sells for less than a farthing a gallon in trucks at Baku. Hitherto high freight charges have hampered the trade; but in October last the Government offered a rebate of 1s. 3d. per barrel upon all oil exported, which must cause heavy exportations for the future. Under the new conditions, it is stated that oil can be delivered free on board at Batoum for less than a penny per gallon; and freight and delivery in English ports would not cost another halfpenny per gallon. Such are the prospects of cheap Russian oil in the future. It is an outlook full of interest for gas manufacturers; for this impending deluge of cheap oil is not only capable of being carbonized in water-gas plant, and converted into gas in other ways—it will also burn in lamps.

The Falkirk Gas Bills in Committee.

The recent parliamentary proceedings in regard to the gas supply of Falkirk were summarized in our last week's issue, and we report elsewhere the evidence laid before the Lords' Committee which led to the settlement already notified. So far as the issue touches the people of Falkirk, there is little more comment to be offered. If the ratepayers of the borough are satisfied at having secured by going to Westminster, and at enormous expense, terms with the Gas Company which might have been had at any time at the cost of a little courteous plain dealing on the part of the Corporation, we have nothing to say to them on the subject. For the behoof of ratepayers of other towns similarly afflicted with a "stalwart" Corporation, it may be worth while to point a moral from the Falkirk example. Here was a case of a Gas Company desiring to do no more than every other Gas Company in the kingdom had done—some of them many times over. They wanted to carry on an increasing business under statutory protection. This proposal did not meet the views of the Falkirk Town Council, who are presumably an "advanced" body, containing a proportion of members prepared, by the diligent study of trumpery "popular" newspapers, to jeer at the idea of any vested interest in connection with gas supply. What did it matter to these gentry that the Falkirk Gas Company represented the interest of enterprising people who had ventured their money in lighting the town at a time when others held aloof? Gas supply is good business now; and so the Corporation could go into it gaily, certain of the support of all the free and independent electors upon the municipal roll. Why should the property of the pioneers in gas supply in the district be respected? Well, the parties went to Parliament—both the Company and the Corporation—with their Bills; and the old question of whether public money should be employed to compete, in such a matter as gas supply, with previously-sunk private capital was tried again, with the usual result. If the Corporation want the local gas undertaking, they must buy it at a fair price; and they are not to depreciate its value by the crude device of procuring competing powers of supply. The decision of the Lords' Committee is eminently just; but it is such actions as this of the Falkirk Town Council that give one pause when the praises of municipalism are being sung in and out of Parliament. We congratulate the Falkirk Gas Company upon their successful resistance to the marauding policy of the Corporation; but it is no credit to Scotch common sense that a score of Counsel and experts and a parliamentary inquiry should have been required to arrange a compromise that two or three business men could have agreed upon in ten minutes.

The North of England Association Meeting.

The North of England Association of Gas Managers met last Saturday at Newcastle-upon-Tyne, under the presidency of Mr. D. Terrace, who is succeeded in the chair for the current year by Colonel Sadler, of Middlesbrough. A paper was read by Mr. Herbert Lees, of Hexham, upon "Gas Undertakings in Relation to the Use of Gas-Engines," the text of which will be found in another column. It appears, from the author's own confession, that he was spurred on to deal with this subject by the taunts of Mr. Emerson Dowson as to the indifference of gas managers in general to the popularization of the gas-engine as a source of motive power; and he accordingly instituted an inquiry among his fellow-members of the North of England Association, with a view to eliciting information as to the extent of the encouragement which is offered to the introduction of gas-engines in this particular district. The result of Mr. Lees's investigation is not very striking. He has found that some gas-works in the North of England use gas-engines, while others do not; and also that, while users of gas-engines in some towns enjoy more or less consideration at the hands of the local Gas Company, elsewhere they have to fend for themselves. He has also collected some other pieces of information showing the comparative cost of steam and of gas power under certain conditions, all of which are certainly useful in their way. Mr. Lees is one of those engineers who would like to see gas more extensively used to generate electricity for central station lighting undertakings; but upon this head it is not easy to argue in favour of the extension of special consideration to such a class of gas consumers. Gas undertakings may be as ready to sell gas to electricians as to any other order of customers; but it must not be forgotten that the consumption of gas by electric lighting engines is a very different kind of trade from that arising out of the demand for gas for engines used all day long in factories and workshops. It comes at the very time when everybody else wants gas. It is not a day demand; and, upon its merits, it should be charged for at more rather than less than the usual price. Gas-works have their "load factor," just like central electric lighting stations; and anything that tends to raise the pinnacle of the daily load diagram is to be regarded, if not with disfavour, at any rate with no particular gratitude, by a prudent gas manager. With this observation, we are able to describe Mr. Lees's paper as a worthy study of an order of facts upon which gas engineers do well to keep an eye. A feature of the proceedings of the meeting not entered in the *agenda* was the exhibition and explanation by Mr. Petersen of a highly ingenious and, it is claimed, very successful separator for tar and ammoniacal liquor. This machine is constructed upon the centrifugal principle of action. The members afterwards dined together as usual. The meeting was most agreeable and interesting; but the attendance was not so large as might have been wished.

An Improved Atmospheric Gas-Burner.

In our "Correspondence" columns to-day there appears a letter, and in our "Register of Patents" will be found the description of an invention, relating to a very rare achievement indeed; being no less than a definite improvement of the atmospheric burner as applied to gas-fires. The object of the invention is to prevent the common and unpleasant phenomenon of "lighting-back;" and we are enabled to testify, from inspection of the article, that this end has been fully attained. The description of the way in which this effect has been secured is somewhat difficult to understand; but there is no gainsaying the fact. It is practically impossible to cause the patent gas-fire burner described elsewhere to "light-back" by means which will produce this result instantly with burners such as are commonly used in gas-fires. Moreover, the burner will

act satisfactorily at extremely low pressures, and is much quieter than any other pattern of atmospheric burner, although the great boon of absolute noiselessness is not yet secured. We are greatly interested in this advance in atmospheric burner construction, both on account of the full and frank way in which the inventor has laid his apparatus before us, and also because it comes as a practical response to the criticisms upon would-be improvers of the atmospheric gas-burner which we offered in the JOURNAL for Jan. 9 (*ante*, p. 60). We therein called for an appliance of the kind that should be "uniformly efficient "under all ordinary variations of pressure, incapable of "giving off an offensive odour, silent, safe from risk of "lighting-back, and strong enough to defy all but mali- "ciously inflicted damage." The apparatus now under notice indubitably answers to most of these requirements; and it is worthy to be characterized as a distinct advance in the design of atmospheric gas-burners.

Labour Commission Reports.

FROM time to time statements have appeared in the newspapers in regard to the conclusions expected to be arrived at by the Labour Commission. Indeed, several abstract "reports" of this Commission have been disclosed in this way to the public; but we have consistently ignored all such unauthorized publications, and refused to waste time and space in discussing them. Recently, however, *The Times* and the *Pall Mall Gazette* have, between them, put the world in possession of what may well be the full texts of the majority and the minority reports; it being known that there is an irreconcileable division of opinion on the general subject between two or three Commissioners and the remainder of this heterogeneous body. If these unauthorized publications are even approximately correct representations of the views of the Commissioners, it is difficult to refrain from giving in to the conclusion already expressed in several newspapers, that the whole inquiry has been a failure, so far at least as its immediate result is concerned. Some good was done by the publication of the evidence as it was taken; and the foreign reports—the latest of which (on Russia) has recently appeared—are worth having. But there is the end of the £45,000 in money and the years of valuable time appropriated to the investigation. The Commissioners themselves can tell us nothing in their report that we did not know before; but they tell two different tales. This comes of putting such pronounced partisans as Mr. Tom Mann upon a Board meant to investigate labour questions with an open mind, and report in accordance with their discoveries. What is a Social Democrat if not socially democratic? Yet, after all they can say, Mr. Tom Mann and his co-dissentients from the majority of the Commission have no more definite message to deliver than the philosophic *dictum* that, in their opinion, "the whole force of democratic statesman- "ship must henceforth be directed to the substitution as "fast as possible of public for capitalist enterprise; and, "where this substitution is not yet practicable, to the "strict and detailed regulation of all industrial operations "so as to secure to every worker the conditions of efficient "citizenship." The report of the majority is more precise; but it deals wholly with detail extensions of the laws at present applying to industrial occupations, and has no sweeping recommendations for new legislation in the interest of labour. On this account, it is dismissed by several newspapers as "uninteresting," which means that it is not sensational. We shall not discuss either the majority or the minority report—or the statements put forward as such—at length until the authenticity of the text is placed beyond doubt by the issue of the regulation Blue Book. At the same time, the latest newspaper abstracts purporting to give the views of the majority and minority divisions of the Commission have such an aspect of verisimilitude, that they are worthy of notice as contemporaneous intelligence, if they are not literally and precisely accurate.

The Manchester Gas Committee's Estimates.—In the course of the report of the Finance Committee of the Manchester City Council upon their estimates for 1894-5, it is stated that the Gas Committee are anticipating a diminished revenue of £10,350, with no corresponding reduction of expenditure; and they propose to pay over to the city fund £54,044, against £64,321 last year. When the accounts of the department are laid before the Council, it will be found that last year's payment encroached heavily upon the reserve or contingent fund.

WATER AND SANITARY AFFAIRS.

AT the sitting of the Select Committee on the London Water Bills on Tuesday, the preamble of the Southwark and Vauxhall Bill was declared to be proved. All three Bills have therefore passed this stage. The decision in the last case was given in terms somewhat different from those which were applied to the East London and West Middlesex Bills. With respect to those measures, it was signified that the Committee did not propose to limit the works for which the money was to be raised. But in reference to the Southwark and Vauxhall scheme, the Chairman (Sir Joseph Pease) said that, when the Committee proceeded to consider the clauses, they might have to suggest that the works proposed by the Bill were large, so as to call for some modification. At the same time, it was stated that the Committee had arrived at no conclusion on the subject, but merely wished to have an opportunity of consulting upon it. On the day following this decision, the Committee dealt with the sinking fund question, as affecting the whole of the Bills. This financial matter they found governed by statutes not particularly clear or satisfactory in their character. After taking evidence from the City Remembrancer and Mr. Allen Stoneham, the Committee adjourned until after Whitsuntide, suggesting that in the meantime the promoters and opponents of the Bills might consult the Local Government Board, with a view to some simplification of the law. With regard to any possible limitation of the works proposed by the Southwark and Vauxhall Bill, we may observe that very strong evidence was given to show the need of considerable enlargement in the works that now exist. The Company are at present only able to store less than two days' supply, or only about one-tenth the quantity which General Scott considers requisite. As to the quantity of water to be taken from the river, the Company seek no augmentation under their own Bill, but intend to ask the Committee on the Thames Conservancy Bill to authorize the abstraction of a larger quantity, as absolutely necessary. Sir H. E. Knight, the Chairman of the Company, threw some fresh light on the subject, by contending that, under the statute of 1852, the Company could draw from the Thames any quantity they pleased. The agreements with the Conservancy were simply for pecuniary purposes, that the Conservancy might have money, and such arrangements could not override the statute, which consequently remained in full force. This view of the case may help to explain the conduct of the Directors in abandoning that clause of their Bill which stipulated for a supply from the Thames which should only be restricted by its relation to the volume of water flowing over Teddington Weir.

The West Middlesex Water Company, at their half-yearly meeting last week, with Sir W. H. Wyatt in the chair, were able to rejoice over the second reading of their Bill in the House of Commons, and the passing of the preamble by the Select Committee. The valuable assistance rendered by Mr. Boulnois in Parliament was cordially acknowledged, and formed the subject of a resolution. But there was another Bill in which the Company were interested, by which they were to pay an extra £2000 per annum, and receive nothing in return. Such was the arrangement proposed in the Thames Conservancy Bill, which the Directors were fully prepared to oppose. Referring to the communication from the County Council, asking the Directors whether the Company were willing to enter into negotiations for the sale of their undertaking, the Chairman remarked that the Council "were obviously not sincere." Even supposing the inquiry were genuine, the Company simply wished to be left alone, and had no desire to sell. The fact is that the communication was purely diplomatic, or we might say artful, and embodied conditions which it must have been known could not be complied with. In the midst of the present conflict, the consumers in the West Middlesex district may be congratulated upon their 10 per cent. rebate, and are so far interested in the fortunes of the Company. If the latter are made to bear heavier burdens, the first sufferers will be the consumers, who will be doomed to see their rebate dwindling down. With respect to the prospects of the Company's Bill, the Select Committee are evidently impressed with the necessity of making the supply as ample and as pure as possible, for which purpose both

storeage and filtration must be adequate. This consideration applies to all the Bills; and it will be a matter for regret if the proposed works are in any way restricted. The Companies make no objection to the allocation of the capital to the works for which the outlay is to be incurred; and, in the case of the West Middlesex Company, the legal limit of the dividend is already reached. Considering the present menace to the public health by the presence of something like cholera on the Continent, the London Water Companies need to be encouraged rather than hampered in the improvement of their works and the extension of the supply.

Gas Undertakings Returns.—In the House of Commons, on Monday last week, the usual sessional order was made for returns in regard to all the gas undertakings in the United Kingdom—for the year ending Dec. 31, 1893 in the case of the companies, and for the year ending the 25th of March last in that of the local authorities.

Institution of Civil Engineers.—At the monthly ballot for membership of this Institution last Tuesday, Mr. A. Fraser, of the Grand Junction Water-Works, was elected a member; and Mr. A. E. Douglass, of the South Staffordshire Water-Works, and Mr. C. H. Rutter, of the Brighton and Hove Gas Company, were admitted as associate members.

Death of Mr. G. Ridley.—We regret to record the recent death of Mr. George Ridley, who for something like thirty years had been in the service of the Newcastle and Gateshead Gas Company, and for a considerable portion of this time was Manager of their Elswick works. Deceased was of a most genial disposition, and consequently made many friends. He was about sixty years of age.

Mr. James M. Veevers has been appointed Engineer, Manager, and Secretary to the Rochester, Chatham, and Strood Gaslight Company, in succession to the late Mr. Syms. Mr. Veevers, it may be remembered, was for nearly ten years Engineer and Manager of the gas-works of the Denton Local Board—a position which he relinquished to take an appointment with the Rochester Gas Company at the beginning of last year.

Death of Herr Mannesmann.—The death is announced of Herr Reinhard Mannesmann, the inventor of the system of tube manufacture which bears his name, and the founder of the Mannesmann Works at Remscheid. The above-mentioned system was alluded to in Vol. LVI. of the JOURNAL (p. 801). Deceased also introduced methods of manufacturing water and illuminating gas, which were described in the succeeding volume.

Discoveries of Coal in Durham.—In the JOURNAL last week, reference was made to a new coal-field about to be developed in North Nottinghamshire. In addition to this, a seam of excellent coal has lately been discovered at West Hunwick, near Bishop Auckland; and more recently boring operations, carried on at the Newfield Colliery, have resulted in another seam being found. Its height is 2 ft. 9 in.; and the quality of the coal is reported to be very good.

Water-Gas Manufacture in England.—It is just possible that the next twelvemonth may witness an extension of the use of Lowe water-gas plant in this country, as we understand Mr. A. C. Humphreys, General Superintendent and Chief Engineer of the United Gas Improvement Company of Philadelphia, has decided to sever his connection with that Company, and come to England, in order to devote his entire attention to the development of the business in which he is already associated with Mr. A. G. Glasgow.

Presentation to Mr. W. W. Parkinson.—The approaching marriage of Mr. W. W. Parkinson, the eldest son of Mr. W. C. Parkinson, L.C.C., was recently chosen by the employees at the Gas-Meter Works, Cottage Lane, City Road, as a fitting opportunity for testifying their regard for him by making him a presentation. It consisted of a solid silver teapot (bearing a suitable inscription), cream-jug, and sugar-basin of very elegant design. Speaking on behalf of the employees, Mr. S. Back, the foreman of the works, expressed the hope that Mr. Parkinson and his wife might be spared for many years to use the gifts. Mr. Parkinson, in accepting the presents, expressed his pleasure in doing so. He thanked Mr. Back and the men for their kindness, and wished them all prosperity.

The Managership of the Elswick Gas-Works.—We learn that Mr. W. D. Gibb, son of Mr. J. S. Gibb, the Treasurer to the Edinburgh and Leith Gas Commission, has been appointed to succeed Mr. G. Ridley, whose recent death is referred to elsewhere, as Manager of the Newcastle and Gateshead Gas Company's works at Elswick. Mr. Gibb's promotion has been very rapid. He was trained as an engineer in Edinburgh; afterwards serving for upwards of four years with Messrs. Laidlaw, Sons, and Caine, of Glasgow. On leaving that firm, he entered the Leith Gas-Works, where he received a practical training in gas making from Mr. F. T. C. Linton. Eighteen months ago he was appointed Assistant-Manager in the Newcastle and Gateshead Company's works at Redheugh. There he has given such satisfaction that the managership of the Elswick works was unanimously entrusted to him by the Directors, without asking for candidates for the post.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 864.)

THE week just concluded has been a dull und uninteresting period on the Stock Exchange. Business scarcely began in earnest until Wednesday, owing to the awkward incidence of May Day, which left Monday isolated between two holidays; and the whole volume of business effected in the four working days that remained reached only a very moderate figure. And there was not much life about that; for there was certainly a tendency to drop back into the lethargic condition of old. Good sound investments held their own fairly well; but the more speculative departments went heavily. The position of affairs in the United States was dispiriting, what with apprehension regarding the Tariff Bill and defaulting lines; and the continuous fall in the Indian exchanges is becoming more serious than ever. The condition of the Money Market is fairly easy; the demand being no greater than what was to be expected now. The Gas Market has been very quiet and featureless; changes in quotation are very few, and, for the most part, very unimportant. Taken generally, the market may be characterized as decidedly firm. To thick-and-thin advocates of the electric light, the figures recently divulged by the Commissioners of Sewers as to the cost of lighting the City so far as it has been extended have come as a disagreeable shock. It is amusing to note how a section of the Press, which had been loudest in denunciation of the iniquities of Gas Companies, and most persistent in demanding the adoption and extension of electricity, has now turned round, and is enjoining the necessity of careful consideration before public authorities commit themselves to further expenditure over this "costly illuminant." Metropolitan Gas Companies are unchanged. Very moderate business was done in Gaslight "A" at about middle figures; but the secured issues realized the best prices. South Metropolitans were strong, especially the "A," which was more than once marked at top price. Commercials were not dealt in. Scarcely any business was done in Suburbans and Provincials, and quotations did not move. Of the Continentals, Imperial had a further slight fall; but Union and European were very firm. Several of the minor Companies have improved, including Australian, Bombay, Chicago, and San Paulo. The Water Companies were very firm—the Parliamentary Committee having dealt favourably with some of them; and a general advance has been made nearly all along the line.

The daily operations were: Business was very sluggish on the opening day, and quite insufficient to afford any indication of a tendency either way. Gas quotations did not move; but Chelsea Water rose 2. The Exchange was closed on Tuesday. Business was more brisk on Wednesday, and good prices were obtained for several stocks; but still quotations remained as before. The advance in Water was continued, with a rise of 2 in Southwark, and 1½ in East London. The course of business in Gas on Thursday was much the same as the day before; prices being good at the old quotations. In Water, East London and Lambeth 10 per cent. gained 1 each; and Lambeth 7½ per cent., 2½. On Friday transactions were more restricted. San Paulo rose ½; and both Bombays, ¼ each. But Imperial Continental fell 2. In Water, West Middlesex advanced 2; East London, 1½; and Grand Junction, Lambeth, and Southwark, 1 each. Saturday was quiet; the only move was a rise of 1 in Australian.

ELECTRIC LIGHTING MEMORANDA.

Sir John Pender on the Metropolitan Electric Supply Company—The Average Rental of Electric Lamps—The Vibration Trouble.

THE speech of Sir John Pender, Chairman of the Metropolitan Electric Supply Company, at the recent ordinary general meeting of the shareholders, was an interesting review of the actual position of the undertaking, which is to be regarded as the most important concern of the kind doing business in London. During the past year there has been a second issue of debentures, bringing the capital of the Company up to £600,000, which has practically been all spent, and more will be required—as the Chairman says, to make provision for supplying the new customers who continually demand the Company's services. The undertaking has now, in the opinion of the Chairman, arrived at the stage of its development when the cost of management should no longer be charged to capital, but should be borne by revenue; yet an exception is still made of some of the engineering expenses, which are allocated direct to the more important items of construction by way of percentage. It does not appear whether or not this policy is to be adhered to as a regular thing; but while it is doubtless a convenient, and in some circumstances could not be described as an unfair, arrangement, so long as it is practised the undertaking cannot be said to pay its way wholly out of the earnings. The effect of charging general management expenses to revenue, however, has been to show where these might be cut down; and accordingly the Board have saved nearly £4000 under this heading during the year. Evidently the heyday of the "professor consultant" is passing away. The most remarkable of Sir John Pender's statements from our point of view was his

confession of disappointment with the rate of growth of the Company's business for the past winter. Instead of the 50 per cent. increase which the Board expected so recently as last November, when they issued a circular declaring that the rate of growth in the business was being fully maintained, they are now fain to admit that the increase has been of the "decremental" order. This awkward fact is, of course, explained in the familiar manner; but, taken into consideration with the notable action of the Board in the matter of the management expenses, it is clearly regarded at head-quarters as a hint that henceforward the Company must cut their coat according to their cloth. In other words, while the undertaking will doubtless go on growing, the point of saturation of the district is coming within measurable distance; and the administration must adjust itself to the limitations of the new order of things if the 5 per cent. dividend the Board look forward to is ever to be fairly earned. At present the proprietors have to be content with a dividend of 5s. upon every £10 share fully paid.

Certain statements of high technical as well as financial interest were made by Sir John Pender in the speech discussed in the foregoing paragraph, and we separate them out for mention by themselves because they bear upon a subject of cardinal importance for all who may happen to engage in the fascinating pastime of estimating receipts and expenses for a proposed public electric lighting plant. This is an amusement greatly affected by members of local authorities in different parts of the country; and the game would be harmless enough if it never led to waste of public money. Speaking of the directorate of the Metropolitan Electric Supply Company, Sir John Pender confessed that "after very careful investigation, we made the calculation, at the time the Company was formed, that we should receive at least £1 per light. I was," he says, "rather pulled up for mentioning such a low figure, and other experts put it at 25s. and 30s. per light. *The average price of our light to-day is 8s. 9d.*" The significance of this declaration can hardly be exaggerated. In addition to this statement of the average return per lamp on circuit, the Chairman of the Metropolitan Company—no little concern struggling in an out-of-the-way corner of the world, be it remembered, but a fine example of the combination of capital and intelligence devoted to popularizing good electric lighting in the centre of London—said that at the present moment the Company's machinery would produce in about forty days all the power they can use in the course of the year. These are the kind of difficulties a central station electric lighting concern has to grapple with; but they are precisely the things that do not appear in the ingeniously-worded reports of certain experts proffered as bait for investors or ratepayers as the case may be.

Following the experience of the London Electric Supply Company, the Metropolitan Electric Supply Company have been worsted in a Chancery suit for damages caused by vibration set up by the generating plant at one of their stations. After this it may be pointedly said that vibration is a "word of fear," unwelcome to the ear of the central station electrician. The case in point arose in connection with the Manchester Square station of the Company; five householders having, as they alleged, been driven to invoke the Court to restrain the defendants from carrying on their business in such a way as to cause an intolerable nuisance in the neighbourhood. The defence was first a denial that an actionable nuisance had been caused; and secondly, that the proper remedy for sufferers was by compensation under section 17 of the Electric Lighting Act, 1882, and not by way of injunction or damages. In the event, the Court made short work of this defence, and granted an injunction; suspending it, however, for three months in order that the defendants may be able to complete the remedial works upon which they are actually engaged. These actions are a great affliction for electric lighting companies; but they are, after all, the price which these ventures must pay for suiting their own convenience by plumping down their generating stations in the heart of their supply districts. If it was a case of gas instead of electric supply, the works would rightly be ordered out of a neighbourhood which their presence might prejudicially affect. In the case of an electricity works, however, people have been deluded, by the neatness of the plant and its appearance of harmlessness, into thinking that no nuisance could arise from its operation. It has therefore been overlooked, in many instances, that an electricity-mill is, to all intents and purposes, a factory—and, moreover, a factory wherein motor machinery of great power and highly concentrated type is operated day and night. How to drive extremely powerful machinery without causing vibration in everything based upon the common earth in the same neighbourhood, is a problem not yet solved. Hence these legal troubles. The same objection applies in some degree to private electric lighting installations. Instances might be named of important buildings practically ruined in the estimation of their users and occupants by the vibration caused by the electric lighting machinery in the basement. It was recently proposed to light St. Paul's Cathedral in this way; and we believe experiments are now being carried out. We do not know what may come of the project; but it is certain that no effect of electric lighting in such a national monument—the "temple of reconciliation and of silence"—could be worth the price of the insistent tremor and the ubiquitous hum which usually accompany the best-regulated private electric lighting installations of any magnitude.

THE SANITARY EQUALITY OF GAS AND ELECTRIC LIGHTING.

Problems of ventilation in regard to public buildings are continually being discussed in publications devoted to engineering and building subjects; and the interest of gas engineers in such topics is obvious, seeing that whether gas is used for the lighting of large buildings or not, it is very generally employed in aid of the ventilation. It has been repeatedly pointed out in the Journal, however, that the technical public are treated to many more projects of ventilation than to reports upon the actual working of systems; yet in no branch of sanitary science is precise and reliable information respecting results more needed for the purpose of proving the value and sufficiency of plans. This observation applies particularly to the proposals which are so often made for the substitution of electric lighting for gas in theatres, assembly rooms, &c. It is commonly asserted in this connection that a system of lighting which makes no demands upon the oxygen of the contained atmosphere of crowded interiors must, on this account alone, be preferable on sanitary grounds to a light of combustion; and there can be no doubt that this pretension goes a long way with people who do not realize the necessity for a free circulation of the air within, and an ample admission of fresh air to, apartments intended for human occupation, wholly irrespective of the means of artificial lighting. Nothing is ever heard of the effect on the atmosphere of public buildings of any change of the system of lighting after it has once been made in deference to this claim; but the fact that in theatres and lecture halls lighted by electricity, the gas is still burnt in the ventilating ceiling lights with which such interiors are usually provided, goes to show that the alteration is of small sanitary value.

The whole subject of the ventilation of important public buildings of intricate interior arrangement has been raised in an interesting form, during the past few days, by the issue of a report by Mr. James Keith, well-known as an expert in this branch of sanitary engineering, upon the working of the warming and ventilating apparatus of the Houses of Parliament. Mr. Keith was called in by Mr. W. Pim, the Resident Engineer, in accordance with instructions given by the late First Commissioner of Works; and he has gone into the matter very thoroughly. The first comment he makes upon the present warming and ventilating arrangements of the legislative palace at Westminster (which have formed the subject of many newspaper and magazine articles, and are described at length in all the text books) is the very natural one that casual observers who have had the privilege of seeing the arrangements in question, and have been told of the great volume of air that is continually being passed through the various sections, would be impressed with their completeness. It is this impression, we take leave to remark, that all makers of ventilating plans seek to produce, and that is very commonly produced by such plans. But as in the case of the Houses of Parliament, a brief experience of the effects actually obtained by some (theoretically) perfect systems of ventilation is often enough to demonstrate that in practice these arrangements leave much to be desired.

Two principles are followed in ventilating the Houses of Parliament; the air of the greater portion of the building, including the debating chamber and other sections of the House of Lords, and the various committee rooms, lobbies, and corridors common to both Houses being changed by what is called the natural system, in which the fresh air is drawn in from outside, and the vitiated air is aspirated by means of shafts. This extraction of the vitiated air is effected by the adaptation of the main towers as aspirating shafts; large coke fires being maintained at their base all the year round. Into these extracting shafts, the air is drawn through, in some instances, considerable distances, and from all directions, leading off from the ceiling-levels of the rooms. In summer the incoming air is washed and cooled, and in winter it is warmed over steam pipes, before being passed on to the different systems. For the ventilation of the debating chamber of the House of Commons, however, separate provision is made, into which a *plenum* also enters. The vitiated air is still exhausted by the upcast shafts from the ceiling-level; but, in addition, a supply of fresh air is blown in, by the action of a fan in the basement, through the grated floor of the chamber.

It is easy to perceive from the foregoing description that the efficiency of these arrangements is dependent on the adequacy of the admission and exhaust, and the completeness of the access of the fresh air currents to all parts of the interior. There are many minor points to be considered in due order; but the question of adequacy comes first, and that of distribution second in importance in the examination of all ventilation systems. Mr. Keith finds that the extraction shafts are inadequate to their work in summer time, although they may suffice during the winter; and he condemns the distribution as radically defective. Moreover, he objects to the heating of the air in cold weather by steam-pipes, which, he declares, drive the "electrical condition and life-giving properties" out of it. There seems to be a little looseness of thought here, which Mr. Keith's critics will fall upon and make the most of, to his discredit; but it is easy to understand his meaning, and possible to agree with his conclusions while doubting his premises.

A more important point in this report, from the sanitary side of the question, is the discovery that the air admission into the

debating chambers of both Houses is through a grated floor covered with carpets or matting. Anything more objectionable than this arrangement it is difficult to conceive. The idea originally was that, in the debating chambers and division lobbies, the whole floor area should be covered with a carpet, pretty open in texture, and composed of a mixture of horse-hair and wool, through which the fresh air would freely pass, but at a low velocity, and be equally distributed over the entire area. It is easy to perceive the object of the originator of this plan; but unfortunately he did not realize the fact that British legislators are not Japanese, to leave their boots at the portals of the sacred precincts of St. Stephen's. An immense amount of dust, not of the sweetest kind, is brought in by noble lords and honourable gentlemen alike, whence it is concluded by Mr. Keith, certainly with reason, that "the fact that members and others have to walk or crowd over and stand on the floors through which all the fresh air is admitted into the debating chambers, division lobbies, and committee-rooms (however the floors may be carpeted) is not good in principle."

The vicious system of depending for the removal of the vitiated air from all parts of the Houses of Parliament by upcast shafts, drawing from hundreds of different exhaust orifices at various distances from the source of the motive power, cannot be wholly cured. It stands to reason, however, that the most direct and the shortest conduits will deliver a brisker current into the shafts than tortuous or longer channels supposed to take their supply from distant apartments. This will happen whatever the means of extraction adopted. As to this, Mr. Keith suggests the substitution of mechanically-driven fans for the coke fires hitherto kept burning at the base of the various shafts, on the ground that the fans might be driven at any desired speed, and consequently to any degree of exhaustion. He remarks on this head: "The fans have merely to be run faster or slower, to give increased or decreased extraction; whereas the coke fires can only give an extraction varying in strength as the outside atmosphere varies in temperature." This is true on the face of it; but it might be asked whether the intensity of the fires could not also be varied within wide limits; thus producing a similar effect.

The superior advantages of the *plenum* principle of ventilation are very apparent in Mr. Keith's report. It is admitted that the supply of air to the House itself is ample in winter, and only needs to be slightly increased in summer. But the distribution is found to be defective, inasmuch as there is no provision for directing a flow of fresh air to the spaces of the House that are overhung by the galleries. This statement shows how necessary it is that those who are called to deal with ventilation questions should treat every example on its merits. With regard to fog, Mr. Keith observes that the filtration of the air practised in connection with the existing system was most effectual during last winter in removing this trouble. He says: "There was no appearance of fog whatever in the debating chamber, although the atmosphere was very thick outside, and a great volume of air was being continually passed through the chamber." It is a pity that all interiors cannot be similarly supplied with purified air at such times.

Mr. Keith says nothing about the gas or other lighting of the House of Commons; but he gives an instructive diagram, illustrating the imperfect way in which the fresh air mingles with the atmosphere of the debating chamber until it escapes at the ceiling-level into a loft, where "vitiated air," and "gas products" combine to make an atmosphere of an unpleasant description, whatever may be the actuality. Striking as these statements and this illustration undoubtedly are, the whole state of the case cannot be said to have been expounded by Mr. Keith; whence it follows that there is no guarantee of the completeness of his prescribed remedies. There have not been any chemical or bacteriological tests of the atmosphere of the Houses of Parliament at different periods of the day and seasons of the year, from which the amount of positive air pollution might be ascertained. That the air of the House of Commons is polluted is sought to be inferred from the assertion that "the unfailing effect produced on persons visiting the House of Commons and sitting there (say) for from two or three hours is, first, a feeling of drowsiness," followed by headache and lassitude. This obviously depends a good deal upon the nature of the business in hand.

From our special point of view, the most important of Mr. Keith's statements respecting the ventilation of the House of Commons are as follows: During a crowded sitting last December, when there must have been about 900 persons present, the *plenum* system of ventilation passed into the House 16,974·41 cubic feet of filtered, warmed air per minute; thus providing the "ample allowance" of 18·86 cubic feet per minute, or 1131·6 cubic feet per hour per head. When the House is similarly crowded during summer, Mr. Keith thinks there ought to be facility for giving at least 3000 cubic feet of fresh air per hour to every occupant of the chamber, especially during prolonged sittings. The content of the chamber being 165,000 cubic feet, this rate of ventilation would mean the changing of the entire atmosphere therein about sixteen times an hour. How this could be done without the occupants feeling the sensation of draught is not explained. What we wish to know in this connection is simply this: Supposing such a degree of ventilation to be provided, what difference can it possibly make whether the apartment, be it legislative chamber, theatre, or concert hall, is lit by electricity or gas? It is evident that, in the requirements of good ventilation formulated by the latest authority, the part attributable to the demands of a light of combustion upon the oxygen of the apartment drops out of sight. We believe that this is so, and that if it is a particular question of crowding human beings for hours together into apartments, to whatever purpose devoted, having a content of something like 180 cubic feet per head, the problem of ventilation must be solved wholly without reference to the system of artificial lighting in use. From this consideration, it follows that, for all cases likely to occur in practice, electric lighting has no superior sanitary credentials compared with gas.

Mr. Jonathan Noden, the Chairman of the Stockport Corporation Gas Committee, died last Wednesday morning, after only a short illness. A vote of condolence with the deceased's family was passed by the Corporation on the same day.

Retirement of an Old Official of the Liverpool Corporation Water Department.—At the last meeting of the Liverpool City Council, the members sanctioned the retirement from active service and the superannuation of Mr. W. Whittingham, who, for the past twenty years, has had control of the distribution of water in the borough, and of the fire service. His connection with the Water Department extends back to 1847, in which year the Corporation acquired the works of the Liverpool and Harrington Water Company, in whose service Mr. Whittingham commenced his career. The respect in which he is held by both the indoor and outdoor staff has been marked by the presentation to him of a handsome marble timepiece and walnut writing cabinet, both beautifully mounted and suitably inscribed.

Wooden Water-Mains.—Some interesting observations and figures on the subject of wooden water-mains were recently communicated to the American Society of Civil Engineers by Mr. J. D. Schuyler, in the course of a paper on "The Water-Works of Denver (Col.)." He stated that 16 miles of 30-inch wooden conduit were constructed in that work, in addition to a considerable length of 44-inch pipe. The timber used was California redwood; and the 30-inch conduit was constructed to stand under a head of 185 feet. The total average cost of this pipe was $1·36 per lineal foot, of which about 48c. constituted the cost of trenching and back filling. A gang of from eight to sixteen men laid from 150 to 300 feet of the same sized conduit per day. These mains were composed of staves dressed very smooth to cylindrical sides and radial edges, and were held to the cylindrical form by mild steel bands placed at a distance apart depending upon the head, but never exceeding 17 inches. The pores of the wood were filled with the water under pressure, so that it oozed through to a slight extent. The pipe was framed in the trench, and all handling in full-sized sections was avoided; at the same time the interior finish was so smooth that the most advantageous conditions of flow were secured. Mr. Schuyler estimated that these wooden conduits effected a saving of above $1,000,000 in this particular work.

The Royal Society's Conversazione.—The first *conversazione* of the season given by the Royal Society took place last Wednesday, in the Society's rooms at Burlington House, when the President (Lord Kelvin) received a large number of guests. As usual on these occasions, there were on view a number of exhibits illustrating recent advances in almost every department of science. If one branch was neglected, it was chemistry; the only exhibit being that of Dr. J. H. Gladstone, consisting of bottles containing soluble and insoluble varieties of gun-cotton made nearly half-a-century ago. Electrical science was scarcely so well represented as last year. Nevertheless Sir D. Salomons showed a series of beautiful experiments with vacuum tubes; and Professor Silvanus Thompson repeated, with improvements, the remarkable electrical demonstrations of polyphase electric currents recently made by him at the Royal Institution. In one new illustration, the current was applied to three points of the ring transformer, and two alternate currents were taken off from four points of the same ring. The three-phase incandescent lamps, and the instructive mechanical model of the three-phase method of transmitting power, attracted great attention. Mr. R. E. Crompton, Professor Moissan, and Mr. E. H. Griffiths had exhibits of appliances for turning electricity to practical use in the production of high temperatures in furnaces, and in recording the degree of heat. Professor Roberts-Austen also showed a thermo-electric pyrometer, which, by recording variations of temperature in ink on a band of paper, has revealed some hitherto unsuspected facts of much industrial importance as regards blast-furnaces. A popular exhibit was Mr. W. Worby Beaumont's vibromotor, by means whereof the energy which in most machinery is expended in producing vibrations may be diverted to do useful work and enable the machinery to run smoothly. This subject was ably dealt with by Mr. Beaumont a short time ago in a paper at the Society of Arts, as already noticed in the JOURNAL (*ante*, p. 380). The apparatus shown by Professor Marshall Ward for observing and measuring the growth of bacteria and other micro-organisms, was specially instructive in proving the fatal action of sunlight (and even the electric arc light, when the active rays are not cut off) upon all virulent disease organisms. Professor Williamson showed a collection of sections of fossil plants from the coal measures.

COMMUNICATED ARTICLE.

THE DEVELOPMENT OF THE GASHOLDER.

By A. M'I. Cleland.

III.

The year 1870 may be regarded as the commencement of a new era in the development of the gasholder. Henceforward such structures were to be ranked as among those entitled to the highest consideration of the most eminent engineers of the day. The period of experiment was past; definite theories were put into solid practice; and mathematicians—such as Arson, Baker, Cripps, Monnier and Thibaudet, and Walmisley—critically examined the principles upon which gasholders were or ought to be built, propounded formulæ, or investigated the strains to which such structures might be subjected.

Judging from the records of the Patent Office, the ubiquitous inventor found little to attract him in this field; for from 1860 to 1886 there is little of importance to note in this direction. This is not remarkable; for, indeed, the gasholder was a piece of mechanism so simple in its construction, so reliable in its action, and (looked upon as a "warehouse") so comparatively cheap per cubic foot of storeage, that any improvement therein—as that word is sometimes defined by the inventor—seemed impossible. With one exception, the only patents worth noting, and these merely provisionally protected, are Barker's suggested method * of forming the standards of the framing by making casings of wrought or cast iron, steel, or wood, and filling them with material excavated from the tank; and the confused description of another inventor of "the construction of a gasholder with guide-columns and framing very much like those usually made, and surrounding this gasholder and framing with another and annular gasholder, the framing between the two being provided with roller-paths, so arranged as to guide and support in proper position both holders when rising and falling."†

The exception referred to above is the ingeniously devised manhole for the roofs of gasholders, invented in 1871 by Mr. G. T. Livesey‡—a name subsequently connected in a very close degree with the development of the gasholder. This manhole is so designed that, when fixed over the inlet or outlet pipes of the holder, access to them is allowed when the holder is grounded, without loss of the gas enclosed in the crown.

Improvements, however, there were and of no mean order; the most important being connected with the still vexed question of trussed or untrussed roofs. Had Mr. George Anderson in 1868 advocated as strongly in favour of untrussed domed roofs as he did for untrussed flat roofs, it is possible that the former would have been more generally and sooner adopted than they were. It was the unsupported *flat* top which Mr. Hawksley considered it incumbent upon him to condemn so severely. But the question was bound to come up again sooner or later; the growth of the holder in point of size causing far-sighted engineers to predict that the maximum of development would be reached in a very short period were the old-established lines strictly adhered to.

When, therefore, Mr. Corbet Woodall, in 1874, read his paper, on "Gasholders," before the British Association of Gas Managers and, speaking of Mr. Anderson's paper of 1868, said: "When . . . I undertook to prepare a paper on the same subject, it was with the feeling that the discussion to which I have referred stopped far short of exhausting the interest of the questions then raised," he but echoed the feelings of scores of gas engineers. The tone of the discussion which followed Mr. Woodall's paper was far different from that to which engineers listened in 1868; and, writing the next year, Mr. J. A. Coombs says: "In the controversy between the advocates of trussed *versus* non-trussed gasholders, it is generally admitted that the latter have the greater part of the arguments in their favour, though but few engineers seem willing to risk the possible collapse of the roof if weighted (say) with 12 inches of snow—the maximum weight to which gasholders may be assumed to be subjected."

Two engineers, however, were found who were willing to take this risk—viz., Mr. V. Wyatt and Mr. Corbet Woodall, of the Chartered and Phœnix Companies respectively, though neither of them considered the question of "risk" entered into the matter at all. The innovations they introduced were the results of much mature thought; were founded on correct principles; and were absolutely necessary if any further increase in the size of holders was to be hoped for.

Prior to 1873 trussed roofs were made, as a rule, after one of two designs. Each truss was composed of a centre column, main-bars, and tension-rods, with vertical suspension rods and inclined struts; or else the main bars were trussed with a bow-rod and struts, and a tension-rod running from the crown curb to the bottom of the king-post. The number of trusses corresponded with the number of standards, and represented a mass of iron which many engineers considered might be much better distributed, and possibly reduced.

Briefly, Mr. Wyatt's system may be described as one by which the sides and crown of the holder were supported at a few points only, instead of at each standard. To quote his own words: "It would be better to make eight or sixteen points of support, very bold, and singularly impressive from their magnitude, than to fritter away material in twenty-eight points." This he proposed to do by constructing "ribs," which should extend from the bottom of one side of the holder, up to and across the crown and down to the bottom of the other side. These ribs, which would be (say) ten in number in the case of a holder 190 feet in diameter and 36 feet deep, were to be continuous, and strengthened at the junction of the side and crown sheets by very deep gusset pieces or brackets. Midway between these posts and main-bars, rafters of a lighter construction were inserted. Mr. Wyatt advocated the riveting of the crown sheets to the framing; and he also modified the crown curb, and greatly increased its strength, by forming it with a radius of 3 feet, instead of angular. Many holders of this type have been erected, both in London and the provinces.

The plan advocated by Mr. Woodall was to dispense altogether with the trussing or internal framing, but to strengthen the crown curb by means of angles, plates, and horizontal lattice girders, while struts or gussets were placed opposite each standard. He also recommended the stiffening of the sheeting of the outer holder by the addition of outside posts. A holder of this type, in two lifts (and at the time of its erection the largest in existence) was built to the designs of Mr. Woodall, in 1878, for the Phœnix Gas Company's Kennington Lane Works, with a diameter of 215 feet and a depth of 44 feet. It is interesting to note that the crown sheets of this holder were arranged so as to avoid the use of concentric or radial joints; radiating strips of plate, of a heavier gauge than the rest of the sheeting, running from the centre towards every other standard, and thus cutting up the crown into a number of bays, the plates in each bay being rectangular instead of having their ends convex or concave, and their sides radial. This arrangement was subsequently improved upon and patented by Cutler* in 1879, who devised a plan of "so connecting the sheets together that they will break joint in such a manner that neither radial nor concentric lines of rivets will exist." The crown sheets of the 5¼ million holder erected by Messrs. Ashmore and While, in 1881, to the designs of Mr. George Livesey, were arranged after this pattern, which possesses several advantages over the method ordinarily followed. The chief among them are: The small amount of cutting to waste; the larger size of sheet that can be used; the reduction in the total number of joints; and the economy in labour, and gain in strength.

Turning again to the guide-framing, we notice a gradual change in the form of the standards and the materials of which they were composed. Cast-iron columns were considered to be unsuitable for heights much above 100 feet—both in design and on account of the nature of the material, and also by reason of the massive and expensive piers required in the tanks. As stated in the second portion of this article, the question of design was merely a matter of taste. But engineers were of one opinion as regards the treacherous nature of cast iron, which the greatest care on the part of manufacturers could not always guard against; and therefore they turned to wrought iron as the only possible substitute at their command in the year 1870.

Cylindrical wrought-iron standards were, however, not considered at all suitable, although they were used, in one instance at least, as early as 1854 for a holder 160 feet in diameter and 70 feet in height. Even so late as 1877, the Marseilles Gas Company adopted this form of standard in a two-lift holder having a total height of 52 feet. In 1874, Mr. Woodall introduced a combination of wrought and cast iron in his design of standard for the 215 feet holder before referred to. These standards were of T section in plan—the front and back flanges were made up of angles, flat plates, and bars, while the web was of open cast iron, of a lattice design, in lengths of about 11 feet; the total height of the standards being 92 feet.

This type of standard was largely adopted during the next decade; the cast iron being eliminated, however, as wrought iron grew more and more in favour with engineers on account of its applicability to standards of a great height, and the degree of exactitude to which it could be worked. The standards were of various sections in plan, either T, I, cross, diamond, or rectangular, or combinations of these.

A good example of a standard of T section is to be met with in the three-lift holder erected in 1888 by Messrs. C. and W. Walker for the Sydney works of the Australian Gaslight Company. The tank has a diameter of 206 feet; and "the guide-framing consists of twenty-two lattice standards of T section, connected by three tiers of warren girders and diagonal ties." The base of each standard measures 7 feet from front to back, 3 feet on the inner face and 5 ft. 7 in. on the outer face. The total height is about 122 feet, with a batter, which reduces the dimensions at the top to 2½ feet by 2 feet; the whole being built of angle, T and flat bar irons.

It is too much to expect that gasholders, or their guide-framings, will ever be regarded favourably from an æsthetic point of view; but it is pretty generally conceded that much may be accomplished towards relieving them somewhat of their repulsive ugliness. This was found to have been the case in 1885, when Mr. Charles Hunt designed the twin 6-million holders for the Windsor Street works of the Birmingham Corporation, the framing for which is considered to be the most graceful extant. The section of standard adopted by Mr. Hunt

Patent No. 586 of 1879. † Patent No. 1655 of 1879. Patent No. 3682

* Patent No. 4220.

may be said to resemble double bulb iron in section; each "bulb" or "flange" being formed of a column, 12 inches in diameter, built of steel, with external flanges. The back flange of the standard rakes forward till it touches the front one at the top; the total height being 151 feet. At intervals of 7 ft. 6 in., circular cast-iron struts are inserted between the flanges; each bay thus formed being filled in with bracings of flat bars. The horizontal girders between the standards are severely simple in design; being "formed from two lengths of 8-inch by 5-inch rolled joists laid cross-wise, riveted together in the centre, and stiffened at either end by cross-bracing."

A later and very fine example of the lattice type of standard is seen in the 6-million holder erected in 1893, for the Glasgow Corporation, by Messrs. Laidlaw, Sons, and Co. to the designs of Mr. William Foulis. These standards, of **I** section in plan, have a total height but little under 137 feet, and bases measuring 10 feet from front to back; the pier foundations extending beyond this again. An example of rectangular lattice standards may be seen in those of the 8-million four-lift holder, designed by Mr. G. C. Trewby, and erected in 1891 by Messrs. C. and W. Walker at the Beckton works of The Gaslight and Coke Company. The bases of these standards occupy in plan an area of about 7¼ feet by 6 feet; while the standards at top measure about 2½ feet by 2 feet—the total height being 180 ft. 6 in.

The girders connecting the standards of the two foregoing typical holders also present points of interest; those of the Glasgow holder being three in number. "The two bottom rows are composed of lattice girders, braced together by diagonal bars, so as to form a box girder, and the top row of single girders."* In the Beckton holder, "the distance between the standards is spanned by six tiers of girders placed horizontally, with their flanges in a vertical plane, except the top one, which is of the box-lattice type.† Finally, the framing of both these historic holders is securely braced by either round or flat bars, and is almost entirely composed of steel, of the introduction of which into gasholders mention will presently be made.

The want of lateral stiffness in, and the great depth of base required by, wrought-iron standards of more than 120 feet in height were considered by some engineers to be serious drawbacks to this type of framing; and their objections to it on these grounds are partly responsible for the introduction of an entirely new type. The first drawback can be overcome, or at least mitigated to a large extent, by means of horizontal girders and diagonal bracing. But where the height of the framing is excessive, the depth of base entails an expense in brickwork which is almost prohibitive. Instead, therefore, of using a number of separate wide-based standards, each of which might be considered as acting as a single cantilever, in the new type of framing the whole is made into one huge cantilever, or "hollow stiffened cylinder." In other words, one column is used, say 220 feet in diameter, instead of a couple of dozen columns, each about 3½ feet in diameter. In this style of framing, the "standards" become mere ribs, against which the guide-rollers work, securely strutted and braced by girders, ties, or bars; so that the framework has somewhat of the appearance of an immense bird-cage, without a top, inside of which the holder rises and falls.

The first framing of this character to be erected was that for Mr. George Livesey's 5½-million holder before referred to, in which the standards, formed of flat bars and angles, have a height of 160 feet and a base of only 18 inches. In this guide-framing, erected in 1881, Mr. Livesey replaced the horizontal lattice-girder by wrought-iron horizontal struts of cross section and simple design; and the diagonal ties or bracings, of flat bars instead of round iron, were so arranged that the strain was transmitted from the top of the first standard to the bottom of the tenth.

The common enemy of all systems of wrought-iron framework is rust; and it was in this respect that cast-iron had such an advantage. It is, therefore, absolutely necessary, when using this material for the above purpose, to make the parts as simple in construction as possible, so as to allow no part of the framing to harbour moisture or water; or to be inaccessible to the paint-brush. Special attention was paid to this point by Mr. Livesey when designing the 5½-million holder, and by Mr. Frank Livesey in the 12-million holder at East Greenwich; the details of the framings of these holders being of the simplest nature.

The increasing number of triple-lift holders, and their growing dimensions, caused several innovations to be introduced in the method of guiding them. In 1879, Cutler proposed,‡ in order to more securely guide the inner holder, to build a series of columns inside the tank having guides affixed to them which were to be "expanded at their upper part or made somewhat trumpet-shaped, to ensure that the interior guide-wheels of the inner lift, when descending, should enter the guides freely."

Up to 1880 the guide-rollers were fixed on the English, radial, or normal plan; or on the French, or tangential plan. But Mr. George Livesey, in 1881, combined the two systems, and used both radial and tangential rollers—a combination which has been adopted in all large gasholders since that date, although slightly modified in the 12-million gasholder at East Greenwich. Here Mr. Frank Livesey has used radial rollers and rollers set at an angle which is midway between the radial and tangential. Writing in 1882, Mr. George Livesey says, "By this [the English] system, the wind pressure on the holder is borne by about one-fourth of the total number of guides, whereas by the French or tangential system one-half of them come into play; and by combining the two, the gasholder obtains a bearing on about three-fourths of the guides. . . . . The combination possesses the further advantages that, owing to the side stays on the carriages, the stress on the curb is much better distributed than is the case where radial rollers only are used."*

Turning again for a moment to consider the further development of the bell of the holder, one is struck with the extreme simplicity of the design of the crown curbs of the finest holders built during the last ten or twelve years. In 1881 Mr. George Livesey had the curb of the "largest gasholder in the world" built of an outer crown sheet, 3 feet wide and ¾ inch thick, with an inner and outer angle, and a second plate, 12 inches deep and ¾ inch thick, attached to the latter, and forming the uppermost part of the side sheets; the whole being constructed of *steel*, a material which now began to be largely used in gasholder building. (Steel had been applied, to a small extent at least, to parts of the framing of a gasholder at Brooklyn, New York, in the year 1874; but it was not generally adopted in gasholder construction till after 1881.) The simple arrangement noted above is also to be met with in the 8-million Beckton holder, and in the 12-million holder at East Greenwich; the material being the same. The crowns of the large holders to which the gas world has grown accustomed during the last decade are, of necessity, untrussed—in fact, it is difficult to see how a gasholder, with a diameter of 300 feet, could be built with a trussed crown, irrespective of questions of economy. Reference has already been made to the large extent to which steel was applied in the framework of the most recent holders. It is also now used almost exclusively for the cups and grips, and the heavier portions of the sheeting.

A suggestion was made by Weck, in 1888,† for strengthening the bottom curb by trussing. In the case of a single holder, this would have been done by means of tension-rods running from the crown curb and the bottom curb, and attached at the centre to one strong ring. In a holder of more than one lift, the rods were to run horizontally from the lower curb to a similar ring in the centre.

Various attempts have been made to devise apparatus by which to indicate the height or contents of a holder at any particular time. Where the holder is situated at a distance from the works, or during foggy weather, or at night, it is sometimes difficult and inconvenient to ascertain what its contents may be; and this difficulty is attended with some risk to the safety of the holder and loss of the gas it contains. Where a supply of gas is being rapidly drawn from any holder by means of an exhauster—as, for instance, at the Beckton works of The Gaslight and Coke Company, where the gas is forced through a 48-inch main to augment the supply of some of the other works of the Company—it becomes doubly necessary to know exactly what the contents of a holder may be at any particular moment; otherwise disaster to the holder may ensue.

The most satisfactory indicator is some form of automatic electrical apparatus, such as is used in connection with water reservoirs, &c., as with these appliances, distance is immaterial. There are several varieties on the market at the present time; perhaps the best known being that of Williams and Powles,‡ or that of Burr and M'Whirter.§ These indicators are neat and compact in design, and reliable in their action; but their first cost is high. Another variety has been patented by Mawson and Stuart, only so recently as last March.‖ There are other indicators which, though more clumsy in appearance, are, perhaps, equally serviceable and much cheaper. Among them, may be mentioned Wright's hydrostatic indicator;¶ and the apparatus devised by Sheard and Harrison in 1889.** In Wright's indicator, a reservoir of (by preference) glycerine is fixed on the roof of the holder, and connected by meane of flexible tubing or articulated pipes to a Bourdon pressure-gauge. Sheard and Harrison use a chain, freely suspended from the outside of the crown curb, which, as the holder rises or falls, is lifted out of, or replaced in, a receptacle attached to the roof of a small holder standing in a tank filled with a non-volatile liquid. A pipe leads from this holder to a suitable recording gauge, the indicator of which varies as the weight on the small holder increases or decreases. Or else they use a vertical tube, attached to the side of the holder, closed at the upper end, while the lower end is sealed in the water of the tank. As the holder descends, the air in this pipe is compressed, and the indicator of the gauge responds to the extra pressure; the scale being graduated empirically.

(*To be continued.*)

A Statue of M. Durand-Claye, the pioneer of the system for the agricultural utilization of sewage, has lately been unveiled at Gennevilliers, near Paris. The funds for the erection of this monument were raised by international subscription, in accordance with a proposal made at the Congress of Hygiene held in Paris in 1889.

* Trans. Inc. Inst. Gas Eng., 1892, "Three-Lift Gasholder."
† *Ibid.*, "Four-Lift Gasholder." ‡ Patent No. 4220.

* Trans. Gas Inst., 1882, "Construction of Gasholders."
† Patent No. 17,538. ‡ Patent No. 7078 of 1887.
§ Patents Nos. 14,902 of 1887 and 5775 of 1893. ‖ Patent No. 5157 of 1894.
¶ Patent No. 3992 of 1888. ** Patent No. 4231 of 1889.

TECHNICAL RECORD.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

The Thirty-fourth Half-Yearly Meeting of this Association was held in the Offices of the Newcastle and Gateshead Gas Company last Saturday, under the presidency of Mr. DAVID TERRACE, Engineer and Manager of the Middlesbrough Corporation Gas-Works. There was a fair attendance of members.

THE ANNUAL ACCOUNTS.

The PRESIDENT opened the proceedings by moving the approval of the annual accounts. He congratulated the Association on their being able to carry forward a good balance, and complimented the Honorary Secretary (Mr. W. Hardie) and the Auditor (Mr. J. H. Penney) on the manner in which they did their work.

Mr. S. J. NICHOLS (Darlington) seconded the motion; and it was adopted.

NEW MEMBERS.

The following gentlemen were then admitted members of the Association: Mr. W. Collier, of the Cleveland Gas Company; Mr. E. H. Millard, of Durham; Mr. G. Charlton, of Houghton-le-Spring; and Mr. Whittaker, of West Stanley.

PRESIDENT'S INTRODUCTORY REMARKS.

The PRESIDENT said it had not been the custom to read a formal opening address at their Newcastle meeting; and it was not his intention to depart from this observance. He must, however, refer to the sad loss the Association had sustained in the death of one of their members—Mr. George Ridley—who had been for the past twenty years Manager of the Elswick Gas-Works in that town, and who had been for thirty years in the service of the Newcastle Gas Company. Mr. John Allan, the Editor of the *Gas World*, had also passed away. Both of these gentlemen were prominent figures at their meetings. He was sure he only expressed the feelings of the members when he said that they all deeply deplored their removal. [Just before the meeting ended, the President said he had omitted to refer to the death of Mr. Frank Carr, of the Walker and Wallsend Gas Company, who was for a long time a member of the Association, and who was known in the district not only for his connection with the Gas Company, but also for his literary attainments.] There were only a few general remarks he would make; and these were that, though there might not at present be many new or striking developments in their industry, very great activity existed in the working out of those improved methods which had been recently introduced. This tended to show that coal gas was holding its own, and was likely to do so for a considerable time to come, as the principal source of artificial light. However, they must not rest until means were discovered to obtain nearly the whole of the products from the coal as illuminants, and all the power from the gas, which at present gave the greater proportion of its energy in wasteful heat; only a small percentage being converted into light, even by the best means of consumption.

GAS UNDERTAKINGS IN RELATION TO THE USE OF GAS-ENGINES.

Mr. H. LEES (Hexham) then read the paper on the above subject which he had prepared for the previous meeting, and which will be found on p. 843.

A discussion (a report of which will appear next week) took place on the paper, at the close of which a vote of thanks was accorded to the author.

THE SEPARATION OF TAR AND LIQUOR.

Mr. THEODOR PETERSEN (of Copenhagen and London) next read a paper on "A Method of Separating Tar from Ammoniacal Liquor," for which he received the thanks of the meeting. The paper will appear in a subsequent issue of the JOURNAL.

THE YEADON REVOLVING RETORT.

The PRESIDENT said the Secretary had been consulting with him on the subject of the Yeadon revolving retort. Mr. D. M. Nelson, of Glasgow, was present, and might make some remarks regarding it. The members would doubtless recollect that he (the President) made a statement on the subject a year ago; and some of his friends had been under the impression that it was in his own works that the retort had been established. It had been put into practical work at Ripon, where tests were being made which would shortly be completed; and then a statement would be made public. So far, the results were satisfactory, as regarded illuminating power.

Mr. NELSON said that in the following week they would have continuous working of the retort at Ripon. It would be working on its own account, and not in connection with other gas plant; and they would be very pleased to have anyone calling to see it.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT intimated that the following gentlemen had been elected office-bearers for the current year:—

President—Colonel Sadler, of Middlesbrough.
Vice-President—Mr. H. Lees, of Hexham.
Secretary and Treasurer—Mr. W. Hardie, of Newcastle.
Auditor—Mr. J. H. Penney, of South Shields.
Committee—Mr. W. Ford, of Stockton; Mr. T. Bower, of West Hartlepool.

He also said that Colonel Sadler had written to him stating that an important business meeting prevented him being present, for which he wished to apologize.

Mr. BOWER proposed a vote of thanks to the President for his services during the year. He said Mr. Terrace had been exceedingly active in matters appertaining to the Association since he had come among them; and he had satisfactorily performed all the duties of his office.

Mr. J. H. COX (Sunderland) seconded the motion, and remarked that both the meetings held under Mr. Terrace's presidency had been profitable and agreeable.

The vote was heartily accorded; and Mr. Terrace briefly acknowledged it.

PLACE OF NEXT MEETING.

Mr. FORD stated that he had a letter from Colonel Sadler, suggesting that the next meeting of the Association should be held in Durham or the neighbourhood, in order that he might be able to give the members a cordial invitation to inspect, at his colliery, his new plant for the extraction of the bye-products from coal. If the members now thought fit to select Durham, Mr. Millard had promised that his Board would place at the disposal of the Association, for the purpose of the meeting, their office and rooms.

It was then resolved, on the motion of the PRESIDENT, seconded by Mr. J. WHYTE (Seaham Harbour), to hold the next meeting in Durham.

This concluded the business.

After the meeting, the members and friends dined together in the County Hotel—Mr. Terrace occupying the chair.

OHIO (U.S.A.) GASLIGHT ASSOCIATION.

Annual Meeting at Columbus.

The Tenth Annual Meeting of this Association was opened at Columbus on the 21st of March, by Mr. IRVIN BUTTERWORTH, the President of the Association.

The reports of the Committee and of the Treasurer showed a satisfactory state of affairs. The Special Committee appointed at the last meeting to consider the question of tar disposal, reported that about 3000 tons of pitch per annum were used for making electric light carbons, which represented 15,000 to 18,000 barrels of tar; and that the cost of a distillery of sufficient capacity to deal with that quantity of tar, would be about £1600. Several of the Ohio gas companies had expressed willingness to co-operate; and the Columbus Gas Company, seeing that some time would be required in arranging details of the combination, were proceeding to erect a distillery for their own use. Terms could, however, be arranged for others to join. It was decided that the Committee should continue in office, with instructions to them to take such further action in the matter as they thought proper.

The President commenced his Inaugural Address by alluding to the gradual increase in members, and in attendance at the meetings, that had marked the progress of the Association from the time it was formed up to the present, and spoke of the advantages that had followed its inception. A special feature was the admission of district inspectors and outdoor superintendents, &c., to the full rights of membership; and this had hitherto worked most satisfactorily. The American Association had appointed a Committee on Federation, for the purpose of bringing all the Associations together, with a view of effecting a thorough and exhaustive treatment of the various matters discussed at these meetings. It was proposed to hold a joint conference at Cleveland in May. He heartily supported the scheme; and recommended that a Committee should be appointed by the present meeting to represent the Ohio Association at the conference. President Hickenlooper, at the first meeting, remarked upon the existence at the time of a business depression similar to that now being experienced; but he foretold that, with returning confidence and renewed prosperity, the demand for gas would increase, and that it would be wise to take advantage of the cheapness of materials and labour to make any extensions or enlargements that might appear to be necessary. He could not do better than apply these words to the present position. Hard times had certainly curtailed the consumption of gas in Ohio during the past year. The competition of electric lighting was less; but that of oil had been greater. The latter was not only on account of cheapness, but also because of the growing fashion for fancy lighting; and he therefore advised the members to introduce suspending and portable gas-lamps. Attention was directed to specimens of such lamps exhibited in the room. The President considered that the most pressing question of the day was not how to make the gas, but how to make the most out of it. It was to details of consumption rather than of manufacture, that they should now address themselves; and also to the improvement of burners and fittings, so that gas might not only be as cheap, but equal in other ways to its competitors. Ten years ago, the average price of gas in Ohio was about 6s. 3d.; while now it was not much over 4s. 2d. per 1000 cubic feet. Although this was not necessarily the lowest they could hope to attain, they had various difficulties to encounter that would, at any rate, check reductions. While the cost of manufacture was falling, that of distribution was rising; and the

problem was how to increase the make and the sale of gas without adding to the capital. But he did not think that any further important reduction in price was necessary, in order to enable gas to hold its own. The danger of hostile and misguided legislation was as important as that of competition, There was the heresy of municipal control, and the agitation for a franchise-tax. He contended that the franchise of a gas company in Ohio was not more valuable than that of any other trading company; and therefore a special tax would be an unjust addition to their other obligations. Concluding, the President expressed a wish that his address should be discussed by the meeting just like any other paper.

A short discussion then followed, which turned mostly on the federation question. A Committee was appointed, as suggested in the address; and Mr. Addicks, of Boston, who was present, said that the idea of federation was not the verging of the individual characteristics of each district Association in one grand whole, but simply for combining for the publication of the transactions in one volume, and for the better and more thorough investigation of any question of importance. A subject brought forward before the Ohio Association, for instance, could be submitted in due course to all the others. So far from decreasing the number of Associations, he would very much rather encourage the formation of a small Association in each State.

Mr. W. W. Prichard, of Portsmouth, followed with a paper on "Leaks," which was not intended to treat of gas-escapes, but of other "leaks" about the works. The first leak noticed was the loss of time caused by fitters going backwards and forwards to the works to cut and screw service-pipes, and for other purposes. This was remedied by a portable cart, carrying a vice, pipe-cutters, screwing tackle, and an assortment of the fittings likely to be required. Poor tools were a fruitful source of "leakage;" and the author named some examples. Badly arranged settings, and a wrongly laid-out works caused much loss. In one case, the men had to carry buckets of water a distance of 20 feet to quench the coke. Calculating this out, it meant a journey of 250 miles per annum. A few feet of pipe would obviate it; and two or three such "leaks" soon made up the work of an extra man. But there were many of these leaks that passed unnoticed in all parts of the works. Much time was lost in hunting for particular things as, by systematic arrangement, would be at hand at a moment's notice. There were also leaks in the office, through not keeping proper records of meters and services. A great deal was also lost by not seeing to repairs. It was a good plan to talk to the men about the work. Many an idea would be thus gained; and the men were pleased to be consulted.

Mr. J. W. R. Cline, of Springfield, contributed a paper on "Welsbach Burners with Artificial Gas." He said Auer began to experiment on the incandescent system at the suggestion of Bunsen, who pointed out that the ordinary way of burning gas was wasteful; and he proceeded to describe the construction of the improved burner as now supplied. It was introduced in his city a year or more ago, and had proved a great success. Many consumers who had been lost had been regained; and those who used it were satisfied not only with the light, but also with the light bills.

On the President inviting discussion, Mr. M. S. Greenough said that there was every reason for congratulation at the improvements that had been made in the Welsbach burner since its first introduction about seven years ago. At that time, he was sent to Europe to examine the burner; and on referring to the report presented by him to his Directors in 1887, he was greatly pleased to find that most of the objections then noticed had since been met. The best results claimed then were 10 candles per cubic foot of gas; but now he could get 18 candles, and Mr. Cline had claimed 20. The durability, and the liability to depreciate with use, had both now been improved. A high pressure was at first necessary for the effective working of the burner; but this had been dispensed with. Great advancement had been made, as regarded the friability of the mantle; the chief objection now remaining being the greenish tinge. He was told that the light could be made yellow; but he had not actually seen that modification. Then some difficulty had arisen in smoky cities, by deposits of soot and dust. The burners were a great success in Cleveland; and they were certainly a valuable ally against electricity and high-power water gas. They were almost too bright; and in many cases they required tempering before they could be used. But it would not do to think that the last word had been said, and that there was nothing else to do but to sell the burner. He doubted whether it would be largely used for domestic purposes, on account of the delicate nature of the mantles; but in large stores, where a sufficient number would be employed to make it worth while to have a man to look after them, there was a future for the burner. Mr. Gwynne had made a practical test of the burner seven years ago; but at that time the depreciation was very great. A burner using 2·6 cubic feet of gas per hour gave 33·4 candles at first; but after 200 hours' use, it gave only about 8 candles. There were two sorts then—one giving a white and the other a yellow light. After what had been said about the improvements effected in the burners, he thought that later on they might become a valuable acquisition to gas companies. He would like to ask if the mantle did not last longer under continuous than with intermittent use, and also whether it could be used as long with natural as with artificial gas. Mr. M'Donald asked how long the average life of a burner would be with ordinary use. The chief cause of failure, in his experience, was the formation of a little hole in the mantle, through which the flame forked out and broke the glass chimney. The President said he had lately tested a Welsbach burner. The first test gave 47·8 candles, with 2·9 cubic feet of gas. After 240 hours' continuous use, with one short interruption, the power had not gone back, but had increased 1 candle. This represented nearly 17 candles per cubic foot of gas. Mr. Cantine thought that the delicate nature of the mantle (which would be shattered by a slight shock), and the necessity for careful lighting, precluded the burner from being a practical thing that could be sold freely to everybody. Mr. Boyle said that the burner had proved most successful in competing with electricity at Salem. He also read a letter from a customer, stating that the cost of lighting his premises with oil at 3½d. per gallon was nearly £10 per annum; but with Welsbach burners, and gas at 6s. 3d. per 1000 cubic feet, it was only £7. The same gentleman wrote favourably as to the durability of the mantles. Mr. Mason, the Secretary of the Welsbach Company, addressed the meeting, at the invitation of the President. He did not send out a single burner that would not, with a consumption of 3 to 3½ cubic feet per hour of 22-candle water gas, give at least 70 candles. As to suitability for general domestic use, there was no reason why the burner should not receive as much care and attention as an oil-lamp. It was mostly in demand for stores; but it was finding its way into residences with satisfactory results. A little delay last winter in supplying mantles had proved how much the burner was valued. With regard to the colour, they found that a severe and intense white light appeared to many people to have a disagreeable greenish tint; and to meet this objection, they made a yellow-tinged light, one of which he exhibited. He had lamps in the factory that had been in use 9000 hours; and he thought that, with experience, the durability could, and would, be greatly prolonged. The general average was two mantles per burner per year; but he was now sending out tougher mantles than he did a twelvemonth ago. With natural gas, three renewals were necessary. The explosions when lighting were simply the results of inexperience or carelessness. The small holes mentioned were due to fracture in carriage. Mr. Somerville said that the Welsbach burner had been used in Indianapolis with natural gas; and for a time it seemed likely to shut him up altogether. In a month he had 500 meters returned. But the mantles rapidly failed; and so much difficulty was experienced that, when his customers returned to artificial gas, they would not have the Welsbach burners. In some small towns he had done well with the burner, with artificial gas. Mr. Chollar said that at St. Louis the burner was doing well, displacing more electric lights than gas-burners; but after careful tests, he could not get a higher duty than 12 to 13 candles per cubic foot. He did not, however, care for it to give more. Mr. M'Ilhenny cited a case in which the Welsbach burner had proved to be less than half as costly as electricity.

Mr. Cline replied to the discussion, and to questions. He thought that a durability of 500 hours—or 6 months—was a fair average for ordinary use; but he exhibited a burner that had been in use for a year. They would work at anything between 10-10ths and 25-10ths. They certainly lasted longer under continuous use, because there was some danger of breakage in lighting and extinguishing. He knew one case where, after proving a failure with natural gas, the burner was successfully used for artificial gas.

A paper on "Testing Gas-Meters" was next read by Mr. W. H. Anson, the Inspector of the Columbus Gas Company, who claimed that frequent testing would prove profitable to gas companies. In all disputed cases, the testings should also be attended by a careful and searching investigation, which would usually elicit the cause of the increased consumption. His experience was that meters were wonderfully accurate. Of the contested meters examined during a part of last year, one-third were correct, one-third averaged 3 per cent. fast, and the remainder averaged 2·1 per cent. slow. The average of the whole was 0·3 per cent. slow. Last summer it was thought that some of the meters did not register; and out of 5000 examined, 60 were found to have the valves clogged with a hard, dry, grey deposit, which lifted the valves and let the gas through without measuring. This trouble prevailed mostly with smaller meters. Excluding stopped meters, the remainder averaged 0·2 per cent. slow. The extreme variations were in each case found in the three-light meters; and there was a marked increase in accuracy, ranging from this size up to 200 lights. Several interesting and important facts were discovered in the course of these investigations. Some meters would pass small quantities—say, 5 cubic feet per hour—without registering. In one case, the fault of a non-registering meter, which passed the test as correct, was found to be in the index. The cost of these tests was about 10d. per meter; and he was strongly in favour of regular and periodical testing.

A discussion was held on the paper, in the course of which the views of the author were upheld. It was pointed out that the reason why the smaller meters showed a greater range of variation, was because there were more of them, and they were subject to more irregularity in usage than the larger sizes.

(*To be continued.*)

GAS UNDERTAKINGS IN RELATION TO THE USE OF GAS-ENGINES.

A Paper read by Mr. H. Lees, of Hexham, before the North of England Gas Managers' Association last Saturday.

When asked by the President to contribute a paper to the proceedings of this Association, I had some misgivings as to being able to deal with a subject that had not already been fully discussed by this or kindred Associations. The selection ultimately made suggested itself to me on thinking over the papers and discussions at the meeting of the Incorporated Gas Institute, held at Belfast in June of last year.

It will be in the minds of many who were present at that meeting that the question of gas-engines for driving exhausters was introduced into the discussion on Mr. Bryan Donkin's paper on "Rotary Engines;" and that it was suggested by Mr. Emerson Dowson in his paper on "Gas Power," that the managers of gas undertakings were not alive to their own interests in the attitude adopted in regard to the gas-engine. This, however, was not allowed to pass unchallenged; and enough was said to indicate that it was more than possible the opinion had been formed on insufficient evidence. To judge from isolated cases, it would be easy to get up a very strong indictment against us; while it would be quite as easy to put forth more than ample defence, by selecting a case where considerable enterprise was shown in that direction. Neither of these extremes would be a true statement of the facts; and in all probability, if we take the "happy medium," we shall be near the mark.

By the courtesy of the members of this Association, I am enabled to give particulars of what is being done in the use of gas-engines in the district comprised within the limits of the Association.

A reference to the appendix [p. 845] will show that, out of thirty undertakings dealt with, gas-engines are used at ten. This is a proportion of 33⅓ per cent., as against 12½ per cent. stated by Mr. Dowson as the proportion for the United Kingdom. It is possible that the proportion in this district may be higher than in other parts of the kingdom; but it is difficult to give any special reason why this should be so. Where coal or coke is more expensive, the gas-engine should be in greater demand. The number of works at which gas-engines are used, is not large; and it is more than probable an extension in that direction would be beneficial to some who might participate in it.

In some instances, it may be possible to show that steam is cheaper than gas even on a gas-works. But at present it is my intention to put the case for the gas-engine before you; and in doing so, I have to acknowledge my indebtedness to several gentlemen who have favoured me with the benefit of their experience, which strongly confirms my own.

The 2-horse power (nominal) gas-engine in use at the Hexham Gas-Works has been working constantly night and day—with short stoppages for cleaning and repairs—during the past ten years. This is equal to a life of thirty years compared to an engine in use during the working hours of most industrial establishments. In addition to driving the exhauster, two pumps are in constant use, for pumping water and ammoniacal liquor respectively. It will be understood that an engine ten years old is not likely to be so economical as the modern gas-engine; and therefore the results in this respect are not the most favourable that could be given. The consumption of gas during the past twelve months was 366,700 cubic feet, or 42 cubic feet per hour. The cost of gas delivered into the holder may be taken at 11d. per 1000 cubic feet. This makes a total cost for gas, for the year, of £16 16s., or 0·46d. per hour. The total cost of repairs for the ten years the engine has been in use is £25, or £2 10s. per annum. This brings the annual cost for gas and repairs to £19 6s., or 0·53d. per hour. The cost per 1000 cubic feet of gas made is 0·196d. No allowance has been made for oil, &c., as in any comparison with the use of a steam-engine, this item would presumably be about the same in each case.

It would perhaps be difficult to work at a less cost than this for fuel of any other character, apart from the extra labour involved in the use of solid fuel. It may be argued that there need be no extra cost for labour on a gas-works, as the stokers could attend to the boiler. There is, however, a limit to which you can go in putting extra work on the stoker. In the case under consideration, it would not be conducive to good work to put this extra labour upon him. It may, therefore, be assumed that the cost of labour alone, in substituting steam for gas, would in many cases exceed the cost of gas, to say nothing of the value of fuel used.

What may be taken as a fair comparison between gas and steam is shown in the following table, based upon statistics given by Herr C. Korte in a paper read before the Association of German Engineers about two years ago. The figures contained in the table are calculated upon a working day of ten hours; and the cost appears to include interest on capital as well as all working expenses. The price of coal taken may seem high. But it is not more than is frequently paid in this district for best steam coal; and we may reasonably assume that, if an inferior quality was used, more would be required, and the cost would not be reduced.

TABLE I.—*Comparative Cost of Small Gas and Steam Engines per Horse Power per Hour.*

Gas per 1000 Cubic Feet.	½ H.P.	1 H.P.	2 H.P.	3 H.P.	4 H.P.	6 H.P.
GAS-ENGINES.						
3s. 4d.	4·08d.	2·64d.	2·28d.	2·04d.	1·92d.	1·80d.
2 10	3·72	2·40	2·04	1·80	1·68	1·56
2 6	3·52	2·26	1·90	1·66	1·55	1·43
2 3	3·37	2·15	1·79	1·55	1·46	1·34
2 0	3·23	2·05	1·69	1·45	1·37	1·25
1 9	3·08	1·94	1·58	1·34	1·27	1·15
1 6	2·93	1·84	1·48	1·24	1·18	1·06
1 3	2·78	1·73	1·37	1·13	1·08	0·96
1 0	2·64	1·62	1·26	1·02	0·99	0·87
0 9	2·49	1·52	1·16	0·92	0·89	0·77
STEAM-ENGINES.						
Coal per Ton.						
12 6	—	2·88	2·04	1·68	1·44	1·32

It will be seen from these statistics that, where the cost of gas does not exceed 2s. 3d. per 1000 cubic feet, it will compete favourably with coal as regards power supplied, with engines of 4 and 6 horse power, and at higher prices in the case of smaller engines. We are, moreover, led to believe that these are not the best results that have been obtained with the gas-engine, as Mr. Dowson states in his paper previously referred to that "the makers of gas-engines are obliged to admit that, when town gas costs more than 3s. per 1000 cubic feet, the working cost of an engine of more than 14-horse power nominal exceeds that of a steam-engine of the same power under the same conditions of working."

The case for the gas-engine has, therefore, not been exaggerated; and when it becomes a question of getting gas at the cost delivered into the holder, the comparison is very decidedly in favour of gas.

There are, however, further considerations which apply to gas-works. Coke is generally used for boilers. The value of this depends upon the local demand; and without there being any difference in the quality, it is possible a considerable difference in price may rule as between one district and another. Of recent years, by the introduction of "forced draught," the gas-works manager has been enabled to use breeze and more inferior fuel produced on his works, and which in some cases it was an expense to dispose of. It is not, however, in small works where these conditions are likely to exist to such an extent as to materially affect the cost of steam-power; and it is in these that gas-engines are most useful and economical.

The use of steam appeals to us also on other grounds than that of cost; and so strong is the conviction of some that it is indispensable on a gas-works, that the question of cost would have but scant consideration. It has its uses no doubt; and it is perhaps not too much to say that it has its "mis-uses," to which it is often applied. It is not an uncommon thing to steam-out exhausters, condensers, washers, &c.; and under certain circumstances this may be expedient. But is it not a practice that for many reasons should be deprecated? The knowledge that steam can be applied to these purposes, often leads to the neglect of the application of means which would prevent the necessity for its use. Steam is very useful in preventing the water in the cups of gasholders from freezing; but supposing it is requisite for this and other purposes, is it wise to have a steam-boiler at work all the year round on the chance of being required two or three times during the winter, when, by the use of gas, the motive power of the works could be provided at considerably less cost? If steam is a necessity, it would be more economical in many cases to keep a small boiler in readiness for such cases.

Perhaps something should be said upon the supposed difficulties of gas-engines when applied to exhausters. It is sometimes argued that it is not possible to regulate a gas-engine to meet the fluctuations of the make of gas, so as to keep a level gauge. My experience has not been of that unfavourable character. This can be accomplished by the governor of the engine, and the usual method of bye-passing; the difference between the summer and winter make being dealt with by using drums of different sizes on the exhauster shaft.

It is urged that a gas-engine on a gas-works is an advertisement; and in small towns this doubtless is so. If we have faith in the use of gas-engines, we should not be afraid to show it by adopting their use where we possibly can on our own works. Having done this, we are free to recommend them to others; and this opportunity occasionally comes in our way. Mr. J. Whimster, of Armagh, who takes a great interest in the application of gas-motors on small works, informs me that most of the engines introduced into his town are the result of his having called attention to the one in use at his works; and recently a 20-horse power engine, consuming nearly one million cubic feet of gas per annum, was added to the list—directly through an investigation into the working of his own engine.

The appendix shows that the largest percentage—so far as returns are obtainable—of gas used for motive power in any town or district in the list is 4·46 on the total quantity consumed. This amount is small; and if (as we are sometimes reminded) the future of gas lies in the direction of its utility for other purposes than lighting, we may conclude that we have a very wide field before us. Some of us, however, think we are not to be deprived of all the lighting; and so we are disposed to take a very hopeful view of future prospects. But it is no use to live in "a fool's paradise." While we believe there is a great future for gas, we

also acknowledge that its attainment depends greatly upon the efforts of those who are responsible for the administration of gas undertakings, and the education of consumers. The latter is probably of greater importance than the former; and generally it falls upon the manager of a gas-works to undertake that work in addition to his already multifarious duties.

It would be difficult to lay down fixed lines upon which to work with a view to increasing the consumption of gas for motive power. Where the price of gas is as low as 2s. and 1s. 6d. per 1000 cubic feet, one would naturally conclude that this was sufficient inducement to secure any consumption that it would be possible to get by means of concessions. Something, however, is being done to assist in various ways this branch of our business. On a further reference to the Appendix, it will be seen that in one town gas-engines are let out on hire, and inspected free; in another, easy terms of payment are allowed in the purchase of engine, cost of fixing, &c., and supervision is undertaken in this case also; while in a third, they sell and fix engines for nominal profits. Five undertakings make a special allowance in the price of gas used for gas-engines; and many others allow extra discounts on the basis of consumption.

It has already been shown that, for small-power engines, gas is cheaper than steam when in constant work. Where the work is intermittent, the advantage is considerably increased; and instances have doubtless come within the experience of most of us where the cost of gas has not reached the amount previously paid in fireman's wages.

One of the most recent developments in the use of the gas-engine is in providing power for electric lighting installations. Mr. Dowson has dealt very ably with this subject in a paper read before the Institution of Civil Engineers; and whilst his advocacy had more particular reference to the use of fuel gas, some very interesting and encouraging figures were published in regard to the use of coal gas. The case of the Morecambe electric lighting installation has done service on more than one occasion, and is still capable of being used in a most favourable light for gas as compared to steam. The statistics published in relation to it in Mr. Dowson's paper are the result of working trials made by Messrs. Andrew and Preece, Electrical Engineers, of Bradford. The following is one of two trials made with town gas at 3s. 3d. per 1000 cubic feet:—

Cost of gas per kilowatt		1·555d.
,, labour	,,	0·400
,, oil and waste per kilowatt		0·013
,, water	,,	0·035
Total cost per kilowatt		2·003d.

The following table gives a comparison of what the cost would be with gas at various prices, and under similar conditions of working in other respects; also showing the cost exclusive of labour:—

TABLE II.—*Cost of Generating Electricity by Gas-Engines on the Basis of the Morecambe Experiment with Gas at Various Prices, Inclusive and Exclusive of Labour.*

Price of Gas per 1000 C. Feet.	Cost per Kilowatt, Inclusive of Labour.	Cost per Kilowatt, Exclusive of Labour.
3s. 3d.	2·003d.	1·603d.
3 0	1·883	1·483
2 9	1·764	1·364
2 6	1·664	1·244
2 3	1·524	1·124
2 0	1·405	1·005
1 9	1·285	0·885
1 6	1·165	0·765

These figures become still more interesting when placed alongside published statistics of the working of electric lighting undertakings having statutory powers in the United Kingdom. The cost for coal, oil, waste, water, and engine-room stores (exclusive of labour) is shown in Table III. for the Companies named.

TABLE III.—*Cost of Generating Electricity by Steam Power (Exclusive of Labour) at the Electric Lighting Works named.*

Name of Company.	Cost per Kilowatt, Exclusive of Labour.
Westminster	1·29d.
Birmingham	1·16
Liverpool	0·88
Chelsea	2·22
St. Pancras	1·91
Newcastle and District	1·50
Newcastle-on-Tyne	0·97
City of London	2·34
House-to-House	2·80
Eastbourne	1·93
Metropolitan	2·05
St. James's	1·06

The above costs are exclusive of all labour; and it would only be fair to allow for the cost of firing the boilers, when comparing with the gas-engine. This is not published separately; but I am able (through the courtesy of the manager of one of the Companies named) to give the cost in their case. It works out to 0·25d. per kilowatt. Taking this as an average cost, and adding it to the above figures, a comparison then shows that with gas at 2s. 3d. per 1000 cubic feet it will compete in regard to cost with the most favourable working of the Companies named; and up to 3s. 3d. per 1000 cubic feet, it is more economical than the average working of electric lighting companies' stations where steam is the motive power.

I must confess that, when I entered upon the work of collecting information for this paper, I was not prepared for any such results; and they are not now advanced as being final. But the conclusions suggested are worthy of consideration on the part of those who may have opportunities of going further into the matter. The Morecambe results were obtained on a comparatively small scale; and in that respect they might be supposed to be at a disadvantage.

The working of steam-engines in electric lighting works will doubtless be more costly than in works where a continuous run of nine or ten hours per day takes place; and the comparison with establishments of this character would be less favourable to gas where large powers were required. It is difficult to obtain the necessary information upon which to base such comparison; but from particulars I have been able to collect, though not in a form to make accurate comparison, there is no doubt the use of gas as motive power is making great strides.

All who are in any way responsible for the administration of gas undertakings should aim at still further encouraging this; and I think most of us are anxious to help it on as far as we possibly can. But we have other consumers to take into consideration. There are gas-engines that do not consume more than the artizan does for lighting his cottage; and it would be unfair to make a special reduction in such cases. The same principle applies up to the point at which the gas-engine exceeds the consumption of the largest consumer for other purposes. If a concession is to be made in price, the most satisfactory method appears to be to regulate it by the quantity consumed; and in this way we shall probably secure all the consumers of this class that are to be obtained at all. Other methods may appear expedient and justifiable under certain circumstances, but speaking generally this will meet the case.

It is perhaps not too much to claim that we are continually on the look-out for any possible means of increasing the consumption of gas, and may we not now ask the more practical co-operation of gas-engine makers? That the price of the engine does more to retard an extension of its use than does the price of gas, has been borne out in the experience of many who have had the question to deal with. There have been reductions recently, and the demand has increased concurrently. Still to outsiders it does seem possible to yet further reduce the prices.

We may also reasonably expect further improvements in the construction of the gas-engine. The advances that have been made encourage this expectation; and when some of the drawbacks attributed to the use of the engine for certain purposes have been removed, and it is brought more on a parallel with the most perfect form of steam-engine, we may hope to share in some of the benefits that will accrue.

The Flow of Water through New Cast-Iron Pipe.—This subject was recently investigated by Mr. S. Bent Russell, of the St. Louis (Mo.) Water-Works. The pipe was 12 inches in diameter, 1631 feet long, and laid on a uniform grade from end to end. In a letter to Mr. J. C. Trautwine, jun., Mr. Russell states that, as there was an opportunity to make some fairly accurate measurements on the discharge of the pipe, he had the necessary observations carried out, and found that, under an average total head of 3·36 feet, the flow was 43,200 cubic feet in seven hours; under an average head of 3·37 feet, it was the same; under an average total head of 3·41 feet, the flow was 46,700 cubic feet in 8 hours 35 minutes. Making allowance for loss of head due to entrance and to curves, it was found that the value of c in the formula $v = c\sqrt{r\,s}$ was from 88 to 93.

The Electrolysis of Gas and Water Pipes.—At a recent meeting at Washington, of the National Electric Light Association, Mr. J. H. Vail, M.Inst.C.E., of New York City, brought forward a number of interesting cases of electrolysis. Among them were the following: A plumber in a Pennsylvania city was repairing a water-pipe in a house; and, on breaking a joint, an electric arc formed across the ends of the pipe. The house was not in the direct path of the railway circuit. Investigation followed; and it was proved beyond question that there was insufficient electric conductivity of the track system, and also that the earth did not afford a good return, though the tracks were well grounded. It was found that the railway current was travelling along all pipe systems in its effort to complete the circuit to the dynamos in the power station. Actual tests were made with standard instruments. From 135 readings of the ampère meter, it was found that the water-pipes leading into the station carried an average current of 93 ampères. Further tests showed that, with 23 cars in operation, 40 per cent. of the total current was carried by underground pipes. Another interesting case was brought to light by a fire in the basement of a house. After it was extinguished, it was found that the current of an electric railway system had been carried along the iron water-pipe entering the house. It is believed that, by vibration of the floors, this pipe and a gas-pipe were brought repeatedly into contact—each time forming an arc between them. In this way a hole was eaten into the gas-pipe, and the gas was ignited. After an analysis of the whole matter, Mr. Vail felt justified in recommending the adoption of the complete metallic circuit as the standard for the best railway practice.

APPENDIX TO MR. H. LEE'S PAPER ON "GAS UNDERTAKINGS IN RELATION TO THE USE OF GAS-ENGINES." (see p. 843).

APPENDIX TO MR. H. LEES'S PAPER ON "GAS UNDERTAKINGS IN RELATION TO THE USE OF GAS-ENGINES" (see p. 843).

STATISTICS *having Reference to Gas Undertakings within the District of the North of England Gas Managers' Association.*

Number Corresponding to Name of Undertaking.	Annual Consumption of Gas.	Gas Consumed per Annum by Gas-Engines (Exclusive of Works Use).	Gas Consumed by Gas-Engines, Per Cent. on Total Consumption.	Number of Gas-Engines in Use.	Price of Gas for Lighting Purposes.	Price of Gas for Gas-Engines.	Special Facilities offered for Encouraging the Use of Gas as a Motive Power.	Gas-Engines used on Works.
	Cubic Feet.	Cubic Feet.			Per 1000 Cubic Feet.			
1	4,000,000	nil	nil	nil	3/5 and 3/9	..	..	½ h.p. gas-engine for driving exhauster
2	4,500,000	,,	,,	,,	4/2 and 5/-	..	..	No machinery. [and pumps.
3	10,000,000	15,000	0·15	2	3/3	Same as for lighting.	..	One gas-engine for driving exhauster
4	12,000,000	120,000	1·00	2	3/-	,,	..	No machinery. [and pumps.
5	13,788,700	411,200	2·98	8	3/7	3/1		
6	16,000,000	113,000	0·70	5	3/6	Same as for lighting.		
7	21,000,000	100,000	0·47	6	3/6	,,		
8	22,000,000	876,200	3·98	9	2/8 to 3/-, according to consumption.	,,	..	2 h.p. gas-engine for driving exhauster and pumps.
9	22,000,000	200,000	0·91	4	3/6	,,		
10	23,005,000	1,032,000	4·46	14	3/3 and 3/4	,,		
11	25,000,000	495,000	1·98	8	4/1	,,		
12	28,000,000	348,000	1·24	12	3/1 to 3/5, according to consumption.	3/-, subject to 5 and 10 p. ct. discount, according to consumption.		
13	30,323,900	411,500	1·35	11	4/-	3/-	Meters free for gas-engines.	
14	32,750,000	1,170,000	3·57	10	3/3	Same as for lighting.		
15	34,500,000	1,373,700	3·98	14	3/-	For small engines, 2/6; 6 h.p. and upwards, 2/3	Lower rates for specially large engines. Free service-pipes.	Gas-engines for driving exhauster, pumps, and oxide elevator.
16	35,000,000	nil	nil	nil	2/6 to 3/2			
17	38,000,000	700,000	1·84	8	3/4	Same as for lighting.		
18	43,595,000	377,000	0·87	9	3/4	,,	..	One gas-engine for duplicate exhauster.
19	80,500,000	1,847,700	2·29	13	2/8 and 2/11	,,		
20	120,000,000	1,000,000	0·83	25	2/6	2/4½ and 2/3, according to consumption.	Service-pipe and meter free, and half cost of fixing.	Two 6 h.p. engines lifting coals from barges into retort-houses.
21	180,000,000	2,860,000	1·59	34	2/-	Same as for lighting.		
22	200,000,000	Not recorded separately.	..	35	2/3, less 5 p.ct. discount.	,,		
23	220,000,000	3,172,700	1·44	44	2/3	,,	Gas-engines let on hire; inspected free every three months by arrangement.	
24	246,500,000	8,500,000	3·44	63	2/4½	,,	Easy terms of payment, fixing, &c. Undertake repairs and supervision of gas-engines.	Gas-engines used for blowing, and for driving the whole of the machinery of the fitting-shops.
25	300,000,000	Not recorded separately.	..	about 30	2/-	,,		
26	330,000,000	About 10,000,000	3·03	about 40	2/-	,,		
27	350,000,000	Not recorded separately.	..	60 to 70	2/-, 2/1, and 2/3, according to consumption.	,,	Sell and fix gas-engines and lay services for nominal profits, according to probable consumption.	
28	399,358,000	,,	..	25	2/6, less 7½, 10, 15, and 20 p. ct., do.	,,	Service-pipe laid free of charge.	One gas-engine for pumping water from the river.
29	646,000,000	,,	..	183	1/6 to 1/11, according to consumption	,,	..	One 6 h.p. gas-engine driving 35,000 cubic feet per hour exhauster.
30	1,700,917,000	,,	..	305	1/10, less 10 p. ct. discount, and 5 p. ct. extra discount to consumers of 400,000 cubic feet and upwards per quarter.	,,	..	Two 7 h.p., one 4 h.p., and one 1 h.p., used for driving smiths' blasts, circular saw, drilling-machines, tar and liquor pumps, &c.

Effect of Heat on Lead Pipes.—Attention was lately called in *Industries and Iron* to an example of the extent to which lead pipes may be greatly affected by heat. In the case of a recent electric lighting installation, exhaust steam by some means found its way into the ventilating and soil pipes leading to the drains. One of the first evidences of this was found in the warping of all lead pipes so used. It appears that the heat of the exhaust steam caused the lead pipes to expand and warp. But when the steam was entirely prevented from entering the drains, the lead would not contract; and all such pipes had to be straightened by hand. Each time the pipes were heated they expanded; but in no instance did they show any signs of coming back to their normal condition.

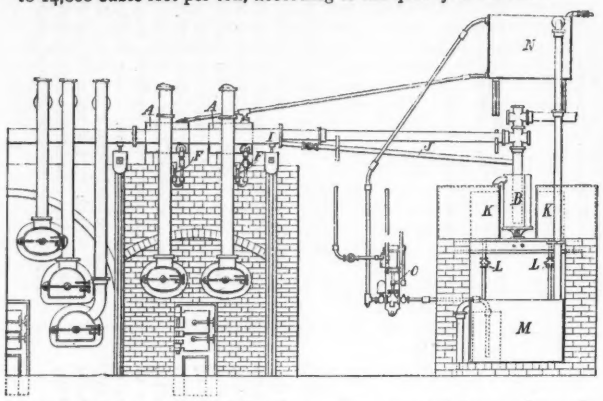
Explosive Mixtures of Ethane and Oxygen.—Experiments on the limiting proportions of an explosive mixture of ethane and oxygen and ethane and air have, says the *Engineer*, led to the following conclusions: (1) When mixed with oxygen, a mixture containing 3·3 per cent. of ethane will not explode even under pressure of nearly 1300 mm. of mercury; a mixture containing 4·6 per cent. of ethane explodes very slightly under a pressure of 250 mm.; while one of 4·5 per cent. explodes at once under a pressure of 350 mm. Mixtures containing more than 8 per cent. of ethane explode too violently to be manageable. (2) When mixed with air, a mixture containing 3·8 per cent. of ethane will only explode when the pressure is as high as 1530 mm.; while a 4 per cent. mixture explodes under a pressure of 596 mm.

Units of Light.—At a recent meeting of the Physical Society of Berlin, Dr. Lummer gave an account of certain experiments he had made on the Siemens and Violle units of light. Both of these must, he said, be rejected as standard units in cases where the platinum is melted in the blowpipe flame. Experiments made to establish the Violle unit by means of an electric current showed that in this case there were variations of from 10 to 12 per cent., which made it unsuitable as an absolute standard of light. The Hefner amyl-acetate lamp, which the speaker had been examining for a period of four years, gives a unit which varies only by some 3 or 4 per cent. as long as the necessary conditions are strictly observed, and allowance made for varying meteorological conditions which affect the lamp.

REGISTER OF PATENTS.

Converting Coal Tar into Illuminating Gas.—Smith, J., of Bangor. No. 7605; April 14, 1893.

As shown in the engraving, this plant, for the manufacture of gas from ordinary coal tar, consists of a retort for vaporizing the fluid hydrocarbons contained therein; also a set of tanks to receive and separate the condensable matters—such as anthracene and naphthalene, and dead oil or creosote—or, by introducing a tank between the hydraulic and foul main, these may be collected there, and by being kept hot can be used as fuel by adopting a spray burner. There will then be left in the retort, says the patentee, "a quantity of pitch, which may be run off into barrels; or, by continuing the distillation to dryness, there will be a quantity of good hard coke, amounting to 6 or 7 cwt. per ton of tar—the quantity of gas produced being from 10,000 to 14,000 cubic feet per ton, according to the quality of tar used."



A tank A is provided of the size necessary to contain one charge for the retort—that is, sufficient to cover the bottom of the retort with a depth of about 3 inches of tar. The tank is supplied by a ball-cock, so that the supply will be cut off when the tank contains sufficient tar for a charge. From the bottom of the tank, a 1-inch pipe F is connected to the ascension-pipe of the retort by a syphon bend. In this pipe, there should be a cock, to be worked by a lever; and from this a rod coming down in front of the retort, to be hooked to the cross-bar when the cock is open. This rod should also be connected by a second lever to the ball-cock, in such a way that no tar shall run into the tank at the same time that it is running into the retort; and, as a charge can be passed into the retort in half an hour, and it will take three hours to carbonize one charge, one tank may be made to serve three retorts. The tar, entering the ascension-pipe at the highest point convenient, will become heated in its descent, and will carry down with it the gas, and so prevent choking of the pipe.

A round cornered ∩ retort gives the largest surface for carbonizing the pitch, and will take the greatest charge. It is made with the bottom flange inside, instead of outside as usual, so that it will take a mouthpiece 3 inches less in height than the retort itself; and the mouthpiece being tapered from the retort, will cause any tar dripping into it to flow back to the retort. In setting the retort, the front or mouth should be about 3 inches higher than the back, as this "will cause the pitch to flow away from the mouthpiece, and collect at the back, where it will be converted into coke, or, if so desired, could (by attaching a pipe to the back, and carried through the brickwork) be drawn off as pitch."

The vapours passing up the ascension-pipe will be largely condensed in the hydraulic main I, and in a short length of foul main J fitted with a draining stopcock. These may be collected in a tank close to the hydraulic main; and if kept hot, may, by the use of a spray burner, be used as fuel to heat the retorts. If preferred to separate the anthracene and naphthalene from the oil, they may be conducted to a round tank B, so fixed that it can revolve round from one tank K to the other, so as to discharge the oil as it comes from the hydraulic main. The two tanks in connection with this must be of such a size that the contents of one will become cold by the time the other is about half full, when the cock L on the drain-pipe under the tank must be opened to allow the oil to drain through a strainer into the bottom tank M, where it is allowed further time to deposit the naphthalene, as the upper tanks K will contain anthracene mixed with some naphthalene.

The oil may, says the inventor, be pumped up to the store-tank N by a steam-pump O, mixed with the fresh tar, and sent back to the retort. But as this will yield only a very small quantity of gas, it will be more profitable to use it as fuel; and in most cases it will be most profitable to use the whole residual as fuel, as indicated above.

There will be a large quantity of naphtha vapours carried off with the gas. These will be condensed in passing through the ordinary condensers, from which they will find their way to the tar well, and thence back to the retort with the tar; or by passing the gas through a separate condenser, they may be collected and returned to the retort direct.

Gas-Motors.—Wilkinson, G., of Southport. No. 8409; April 26, 1893.

This invention has for its object "the production of a reliable and effective motor, which is simple and relatively cheap in point of construction, economically maintained, and regulated in its action in a novel and effective manner, so that it may safely be left to the care of unskilled persons." The principal claims for the invention are: (1) In a gas or like power motor, the combination of two or more cylinders, with a closed crank-chamber enclosing the valves, regulating and other mechanism, with means for distributing the lubricant over all the working parts. (2) The combination of a governor, consisting of diverging discs or covers, with spheres or weights enclosed between them, upon each side of a fixed diaphragm, so that the divergence is always proportionate to the rate of speed.

Prepayment Gas-Meters.—Hawkyard, J., of Saddleworth, and Braddock, J., of Oldham. No. 9771; May 16, 1893.

This invention relates principally to improvements upon the automatic apparatus referred to in patent No. 8410 of 1892; the objects of the present invention being (first) to simplify the means for altering the exact amount of gas supplied for a certain payment, so as to regulate it in accordance with the fixed price of gas for the time being, and (secondly) to provide simple and efficient means for dispensing with the stop-valve, and stopping the action of the meter, and consequently the delivery of the gas, when the amount of gas which has been paid for has been supplied.

Fig. 1.

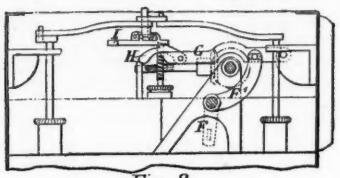


Fig. 2.

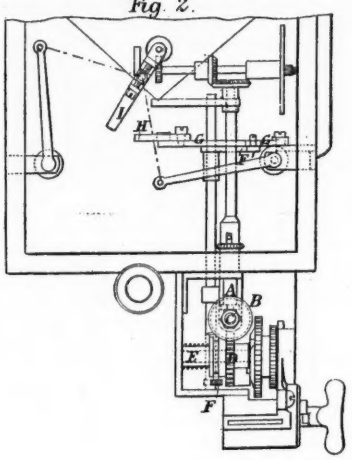


Fig. 3.

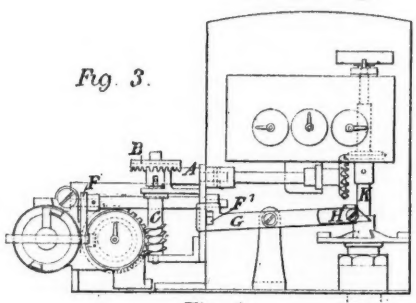


Fig. 4.

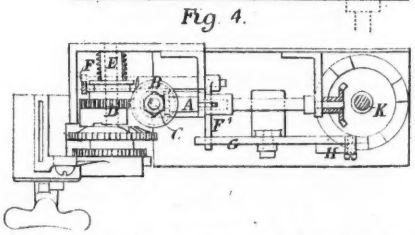


Fig. 1 is a part al elevation, and fig. 2 is a plan view of so much of a dry meter as is necessary to illustrate the invention. Fig. 3 is a front elevation, and fig. 4 a plan of a wet meter. On figs. 2 and 4 part of the shaft, carrying the arms of the bellcrank lever F F¹, is broken away, in order to show the arm F (in section) more clearly.

In the first place, the apparatus is driven by means of a long spur-pinion A mounted horizontally, and in gear with a crown-wheel B, on the top of the vertical worm-shaft C. This crown-wheel is made with a boss, which fits loosely on the upper part of the worm-shaft, and is notched (as in fig. 3) so as to engage with two pins projecting from the shaft; or it is fitted in such a way above the pinion with its teeth downwards, that it will turn the shaft, but can be readily changed for a wheel of greater or lesser number of teeth. The upper part of the shaft is screwed, and made with a shoulder, so that the crown-wheel can be securely fixed thereon, by means of a nut. It is so arranged that, when the crown-wheel is screwed down on to the shoulder, the teeth will be accurately in gear with those of the pinion. Thus no means of adjustment are required on changing the crown-wheel; and whatever diameter of crown-wheel is put on, the teeth will always be accurately in gear with the driving-pinion. Each crown-wheel is marked with figures corresponding with the number of feet of gas supplied for each penny, or other fixed coin; and a sight-hole is provided on the cover, so that the customer can at any time see the number of feet of gas which his coin purchases. The cover is fastened with a seal; and to alter the quantity of gas supplied in accordance with the price for the time being, all that has to be done is to break the seal, remove the cover, and change the crown-wheel for one of a larger or smaller size,

and reseal the cover. The customer can see through the sight-hole if he has put on the proper wheel.

For stopping the action of the dry meter when the proper amount of gas has been delivered, a circumferential groove or neck is formed in the boss of the worm-wheel D on the horizontal spindle E, in which groove a pin engages on one arm F of a bellcrank lever. The other arm F^1 is jointed to a lever G, which carries a pivoted catch H, placed in such a position that, as the worm-wheel slides upon the spindle as the gas is consumed, it gradually raises the catch until, just as the gas has all been expended, the point of the catch comes in the way of the tangent arm I of the meter, and thus stops its action. It also prevents the further supply of gas until another coin has been inserted, which moves the catch out of the way of the quadrant arm, and thus sets the meter free. Or the arms of the bellcrank lever F F^1 may be so formed as to lower the catch-lever H to stop the meter; and in this case, the catch-lever would be mounted directly on the lever.

The principal feature of novelty in this arrangement is that the pivoted catch H oscillates as soon as the quadrant arm I comes into contact with it; and in doing so, it raises its point so as to make its action on the quadrant arm absolute at the first contact.

For adapting this arrangement to a wet gas-meter (as figs. 3 and 4), a similar lever F F^1 is employed, with a pivoted catch H, to act on the teeth of a crown ratchet-wheel, fixed on the upright shaft K of the meter.

Gas-Engines.—Peebles, D. B., of Edinburgh. No. 10,801; June 2, 1893.

This invention has for its object to improve the construction and action of various parts of, or connected with, gas-motors.

The first improvement is in the combined air and gas inlet-valves. Here a main disc valve is arranged to open the inlet-port into the motor cylinder; the port being at the inner end of a cylindrical passage, having within it a concentric tube through which the gas is admitted—the air passing through the annular passage. A separate valve closes the inner end of the gas-tube; and a cap (screwed on the inner end) is made with a lateral perforation, through which, when the valve is open, the gas issues into the annular air stream. This valve is fixed on a tube, through which the spindle of the main valve passes.

A second improvement is called an "anti-pulsator." The moveable disc of the gas-bag is, by preference, placed vertically, and connected to two bell-crank levers, one of which has an arm with an adjustable weight, arranged to tend to close the bag. The other lever has an arm connected to a spindle, which has on it two disc valves adapted to ports in two partitions; and through these ports the gas has to pass on its way to the motor—the gas having access to the bag after passing the ports. The disc valves (for which a single disc or plug may be substituted) move in opposite directions to close their ports, and control the entrance of the gas "in a manner to greatly diminish pulsating action."

A third improvement is in the governor apparatus, by which an ignition is missed (or more than one) whenever the speed is too great. A lever worked by a cam acts on the spindle of the main inlet-valve; and a spring-controlled trigger, jointed on the lever, acts on the tube of the gas-inlet valve—this trigger being moved out of its acting position when required, by means of a lever connected to a bell or inverted cup in an annular trough, containing mercury or other liquid. A space is enclosed, between the bell just mentioned and a larger bell (also in an annular trough, containing mercury or other liquid), and which is made to reciprocate by any convenient part of the motor. An inwardly-opening check-valve is fitted to the larger bell, to admit air whenever the bell is raised; and the air so admitted passes out, when the bell is depressed, through a pipe or passage fitted with a stopcock, adjusted to the desired speed. When the speed is too great, the pressure between the bells increases, because of the air not getting out as quickly as it is taken in; and, in consequence, the smaller inner bell is depressed, and causes the trigger to move aside and omit an action on the gas-inlet valve.

A fourth improvement is in the igniting-device, for which an externally heated porcelain tube is used; the communication between this tube and the cylinder being a lateral passage. The piece in which the tube is held, and in which the lateral passage leading into the inner end of the tube is formed, is made with a small chamber; and it has fixed in it a small tube communicating with the chamber, and extending through the porcelain tube nearly to its outer end. The small tube is open at both ends; and when the ignitable gaseous mixture is, by the compression, made to enter the porcelain tube, the non-ignitable gas just previously therein is forced through the small tube into the chamber, whereby the contact of the ignitable mixture with the heated part of the porcelain tube is ensured.

A fifth improvement consists in providing an igniting-device to be used by hand when starting the motor, at which time the heated-tube igniter must be shut off by a valve. The hand-igniter comprises a tube, screwed into a piece fixed to the cylinder, and having in it a small clip for a friction-match. A rod, to be moved by hand, extends in through a small stuffing-box; and it has, at its inner end, a spring blade, with a roughened part to act on the match. A screw-valve is arranged for shutting off the tube from the cylinder; and another valve, which is of small size, is provided for allowing some gas to issue to the atmosphere, so that the ignitable mixture may reach the match. The last-named valve may also be used for partially relieving the compression when starting the motor.

A sixth improvement is applicable to the exhaust-valve. It consists in fitting it with a small valve adapted to a central port in the main-valve; the object being to relieve the pressure resisting the opening of the main-valve. The spindle which opens the valves is fixed to the small valve, and acts by a collar on a part fixed to the main-valve only after having opened the small valve. The starting of the motor may be facilitated by opening the small valve, by a piece adjusted so as to prevent the spindle from quite reaching its closing position during compression.

A seventh improvement is in the apparatus for lubricating the motor cylinder, and arranged to supply the lubricant only while the motor is working. The lubricant is contained in a cylindrical vessel, having its axis horizontal; and it is maintained at a constant level by a semi-cylindrical or segmental float, which, turning about the horizontal axis, dips further down as the lubricant diminishes in quantity. The lubricant is picked up by one or more rotating spoons, turned by wheelwork deriving its motion from the motor. Each spoon, when in its highest position, delivers its contents into a small cone rotating with it, with its axis horizontal; and the lubricant flows from the cone into the mouth of a tube or passage communicating with the motor cylinder.

The eighth improvement consists in joining the connecting-rod to the motor piston by a pin entered through an aperture in the side or trunk of the piston, and by a key made to rock with the movement of the connecting-rod. The ends of the pin work in bearing-brasses fitted in recesses in otherwise solid parts, between which the inner end of the connecting-rod works. The brasses are adjustable by screwed rods, extending to the outer end of the piston trunk.

Atmospheric Gas-Burners.—Voisey, C. B., of Liverpool, and Stevenson, W., of Warrington. No. 15,912; Aug. 23, 1893.

This invention has for its object to improve atmospheric burners, "whereby their utility may be rendered wider, they may be capable of greater and better regulation, and their proper action at all times assured." To accomplish this, in connection with the part of the burner where the gas is supplied and commences to mix with the air—that is, with the part of the mixing-tube at which air is admitted—a chamber or conduit is provided, which, when a burner lights back, becomes charged with the products of combustion, which do not support combustion, and so extinguish the flame, and cause the gas to burn only at the apertures where intended. A further feature connected with the chamber is that it tends to prevent the burner firing-back when there is a down draught.

Fig. 1

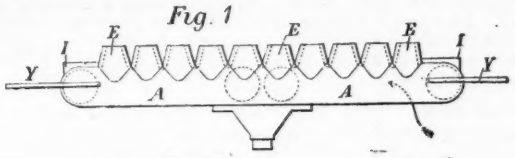


Fig. 2

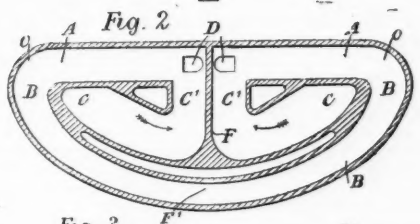


Fig. 3.

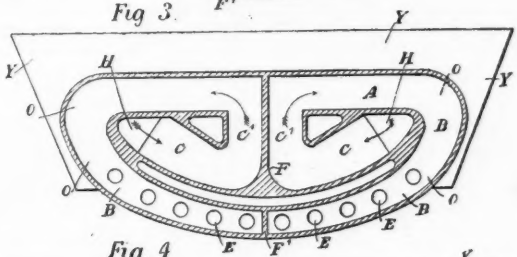


Fig. 4

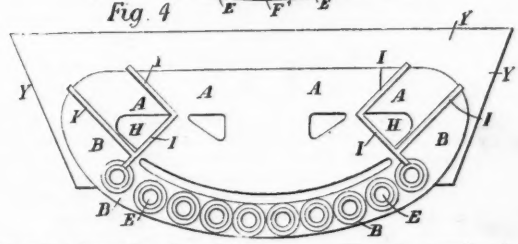


Fig. 1 is a front elevation of the burner. Fig. 2 is a sectional plan looking down on the burner; and Fig. 3 is a sectional plan looking upwards. Fig. 4 is a full plan looking on the face of the burner.

A are the mixing-tubes, in which the gas and air, prior to combustion, mingle; and B are conduits, in continuation of A, from which the mixture is distributed to the flame-nipples. C and C^1 are the passages leading to the mixing-tubes A, through which air supplied to the tubes enters, and wherein the products of combustion flow, if the burner fires-back. D are the gas distributing or supply nozzles; and E are the nipples at which the mixture of gas and air burn in the usual way. The burner illustrated is of duplex construction; all the parts being in duplicate, and the burner divided by central diaphragms F F^1.

The air to the burner is admitted into the passage C through a triangular-shaped opening H; and round this aperture at the top are webs or partitions I, which are carried up above the level of the conduits A B C, and outwards towards the rear of the burner. Upon the upper edges of these partitions, the brick fire-back rests; and the air, therefore, entering from above, passes through the passage from the back of the burner formed between these webs and the underside of the brick slab. By this means, the flame from the nipples is prevented from being blown or drawn into the passage C, or otherwise entering it, and will so avoid the ignition of the gas at the nozzles D, and burning-back of the burner from such a cause.

In normal working, the air to mix with the gas enters the passage or chamber C at the mouth thereof, facing the opening H; and, passing into the passage, it travels by way of the passage C^1 into the tube A, where it mixes with the gas, and then goes forward to the distributing-conduit B. Between the points O this is dilated; and from this point

it decreases in sectional area as it approaches the diaphragm F^1—the decrease being made by the sloping down of the roof of the passage, and the approaching of the sides thereof—the bottom remaining about level. By this construction, the gaseous mixture is distributed equally from all the nipples E, where it burns in a plurality of flames.

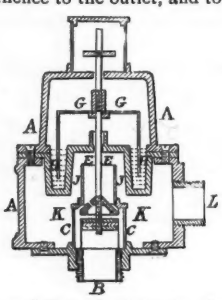
When, by any cause, the flame fires-back, and the gases ignite at the nozzle D, the passages C^1 and C, which constitute chambers, become filled with the products of combustion or choke-damp; so that, immediately after such firing-back, at the commencement of the burning of the gas at the nozzle, the gases are introduced into the inner end of the passage A, and at once extinguish the flame therein at the nozzle. Thereupon it burns in the correct manner—*i.e.*, in its normal state at the nipples E.

Regenerative Gas-Burners.—Lake, H. H.; communicated from T. Gordon and W. R. Swift, of New York, U.S.A. No. 24,909; Dec. 27, 1893.

The principal claim for this invention in regenerative gas-burners is the combination of a nipple for connecting with a gas-fixture, a gas-supply pipe extending upwardly therefrom, an annular gas-burner chamber, concentric with the gas-supply pipe, and provided with a circular row of gas-outlets at its base. In this way, the supply of gas will be above the flame, with a centrally arranged air-heating chamber, located above the annular gas-burner chamber, and having openings for the escape of air. The deflector is supported by the air-heating chamber, and extends downwardly, so as to surround the burner chamber. The globe support is below the burner, and concentric with, and sustained by the gas-supply pipe. There is a shell surrounding the gas-supply pipe, and extending from the globe support to the base portion of the annular burner chamber inwards of its row of gas-outlets. This forms, with the inner wall of the gas-burner chamber, part of a conduit to the air-heating chamber; the shell having perforations for supplying air to the base of the burner, and also to the lower portion of the globe.

Gas-Governors.—Horton, J., of Dudley. No. 694; Jan. 12, 1894.

This governor consists of a perforated valve connected by a rod to an inverted cup, which floats in an annular trough of mercury, and underneath which balance-weights are placed. The valve allows the gas to pass up a pipe underneath the inverted cup, which rises or falls according to the pressure; but gas is prevented from escaping round the inverted cup by means of the mercury. The gas is admitted at the bottom of the governor, up a short pipe, and through the perforated valve into a smaller pipe, which conveys the gas to a small aperture, and underneath the inverted cup, floating in an annular trough of mercury, which rises or falls according as the pressure is regulated by the balance-weights underneath the valve. The valve is perforated, in order to keep a constant supply of gas underneath the inverted cup; and the pipe after leaving the valve is to prevent the gas making its escape by the outlet before entering the inverted cup. The gas passes over the top of the small pipe; down the sides into the lower chamber; and thence to the outlet, and to the burners.



A is the outer case; and B is the inlet to pipe C, and to the perforated valve, connected to the inverted cup G by a rod, which also acts as a guide for the valve. H is an annular trough filled with mercury; E is the pipe conveying gas from the valve to the small aperture, and underneath the inverted cup; J is the space outside the pipe leading to the bottom chamber K, and to the outlet L.

APPLICATIONS FOR LETTERS PATENT.

7988.—Cowan, W. and W. H., "Prepayment gas-meters." April 23.
8039.—Pilley, J. J., "Laboratory Bunsen gas-burner." April 24.
8169.—Butterworth, J. H., "A method of, and gas-burner for, heating or cooking purposes applicable for domestic use." A communication from A. Carter and W. Sweetman. April 25.
8193.—Webb, J. E., "Gas-lamps for the extraction and destruction of sewer gas." April 25.
8243.—Hands, T., and Malam, J., "Injectors for the consumption of tar and other inflammable liquids." April 26.
8244.—Bradbear, T., "Indicating mechanism for gas-meters." April 26.
8272.—Thompson, D., "Tees or other forms of branch pieces for making branch connections to water or gas pipes." April 26.
8295.—Holt, H. P., "Gas or oil motor cars." April 26.
8327.—Glover, R. T., and J. G., "Coin-freed apparatus for the sale of gas in fixed quantities." April 26.
8371.—Bryson, J., Jones, J., and Fraser, W., "Retorts for the distillation of shale and other bituminous substances." April 27.
8439.—Clark, A., and Robertson, J., "Gas-irons." April 28.
8458-9.—Raleigh, M., "Gas cooking-stoves." April 28.

An Unprofitable Half Year for the Ilkeston Corporation Gas Department.—The Chairman of the Gas Committee (Mr. Alderman Beardsley) announced at last Tuesday's meeting of the Ilkeston Town Council that, owing to the large additional cost of coal, no profit had been earned by the gas undertaking during the past half year.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

An Improvement in Burners for Gas-Fires.

Sir,—In the autumn of last year, I communicated to your Journal some particulars of an improved atmospheric burner for gas-fires, gas-stoves, and other gas appliances, which is designed to obviate the risk and attendant drawbacks of "lighting-back." On that occasion, reference was made to only one part of the invention; but now I submit a full description, which may be rendered the more intelligible by the aid of the enclosed photograph.*

Lighting-back may be caused by: (1) Down-draughts playing upon the nipples—*e.g.*, a faulty chimney. (2) Draughts playing upon the air-inlets—*e.g.*, sudden opening or closing of doors, moving objects in front of the stove, &c. (3) Sudden and varying pressure of gas. (4) Too small a nozzle, or choking of the nozzle. (5) Insufficient gas.

When a burner is lighted-back, the gas burns in the mixing chamber at the point where it issues from the nozzle; and it is then unable to obtain a sufficient amount of air to ensure complete combustion. The consequence is that acetylene (C_2H_2) and carbonic oxide (CO) are produced. The former is at once poisonous and offensive to the smell, and is easily recognized; and were it not for the fact that attention is thus drawn to the faulty action of the burner, the latter, the still more poisonous carbonic oxide, might be blown into the room, where the chimney is defective, and, escaping detection, might produce serious consequences.

The public are not insensible of these drawbacks and dangers; and any burner which can be devised to diminish or annul them, must tend to the more general adoption of gas for heating purposes. Gas heating is a luxury and convenience which modern civilization has placed at our disposal; but up to the present time, the drawbacks, though often exaggerated, are considered by many to more than counterbalance the recognized advantages. The new improved "patent choke-damp burner," having surmounted the difficulty of preventing "lighting-back," will, it is hoped, do much to overcome the prejudice which has developed in connection with atmospheric burners of the old type.

It is only necessary to state that these are so defective that they can easily be lighted-back, even when "full on," by a mere puff at the air-inlet; and that out of fifteen stoves by different representative manufacturers examined and reported upon recently by the *Lancet* analyst in his valuable and interesting report, none were capable of safe use when working under a gas pressure of less than 4 inches—averaging a consumption of 20 feet of gas per hour—which is far too high a minimum point of safety. He reports that they are for this reason not suited for general use; and he recommends in their stead a series of several Bunsen burners, each with a separate tap.

It is claimed for the new burner that it will work with a pressure of 0·1 inch, without risk of faulty action, under influences that will disturb the efficiency of the ordinary burner at 0·5 inch. The flame of gas with a supply under so small a pressure as 0·1 inch is practically useless for heating purposes, and would therefore never be required. But the fact is incidentally mentioned to indicate the efficiency of the methods adopted to counteract the tendency to flash-back.

The burner may be described as consisting of two parts, placed in the same horizontal plane—(A) An ordinary atmospheric burner completely divided in the middle line, to the air-inlet of which is fixed (B) an arrangement of tubes similarly divided in the middle line on each half, designed (*a*) to act as a store for carbonic acid; (*b*) to convert draughts or compressed air acting upon the air-inlets into a slightly negative pressure at the points where the air and gas first come into contact.

The principles involved in its construction are two—(1) The utilization of the carbonic acid to extinguish the flame at the nozzle where the gas is ignited, in consequence of the draughts playing upon the nipples. (2) The utilization of the fact that a feeble negative or *minus* pressure—*i.e.*, a pressure a very little less than 15 lbs. to the square inch—is ineffectual to cause lighting-back when applied to the air-inlet at the point where the gas and the air enter the mixing chamber.

When draughts from a faulty chimney or other source play upon the nipples, the flame is blown into the mixing chamber, and causes the mixed air and gas to explode. The products of the explosion—viz., CO_2, H_2O, &c.—are received in A, C^1, C [see p. 847]. The gas is for the moment burning at the nozzle D; but, on the cessation of the draught, the injecting action of the flame subsequently draws the carbonic acid stored in the tubes over the nozzle, and so extinguishes the flame there, and allows the burner to right itself.

But, in my opinion, by far the most frequent cause of lighting-back is a draught acting at the air-inlet—a mere puff in the case of the ordinary burner being sufficient for the purpose. Very frequently the air-inlet is enclosed in a box, only one side of which (usually the front) is open, in which case a draught compresses the air contained therein; and this is even more effectual than a draught passing freely over the air-inlet.

A draught or compressed air acting on the inlets H of the new burner, rushes along the outer and antero-posterior part C of the arrangement of tubes, and creates, so long as either continues to act, a slightly negative pressure in A C^1. In this manner, the disturbing influence of a positive pressure is prevented from acting at the point at which in the ordinary burner air is admitted.

But, in addition to obviating the influence of draughts at the nipples and the air-inlets, Nos. 1 and 2 in the "list of causes" given above, it is found that the arrangement also renders the burner much more tolerant of causes Nos. 3 and 5.

The only remaining cause is No. 4; and this is either a defect of careless manufacture or the result of deposition of carbon, in con-

* Our "Register of Patents" to-day (p. 847) contains a reproduction of the drawings accompanying the specification of the invention referred to by our esteemed correspondent. It is not therefore necessary to reproduce the photograph he sends.—Ed. J.G.L.

sequence of the burner having previously been often lighted-back. The former can be remedied in the making, and the latter in the case of the new burner does not occur.

Liverpool, April 25, 1894. M.D., Lond., F.R.C.S., England.

The Yeadon Revolving Retort.

Sir,—Even by accepting the substitution of the three words Mr. Nelson gives in his letter of the 1st inst. for those he was reported to have said in yours of the 17th ult., I do not then get replies to my three simple and straight questions, which, with your permission, I will again put in a slightly different form:—

(1) Has the Yeadon retort been worked anywhere else than at Ripon during last winter?

(2) Will Mr. Nelson state *definitely* what the difficulties have been that have arisen in working the machine, and if they have been overcome?

(3) Will Mr. Nelson give some *exact* results obtained, say, during last winter, at Ripon or elsewhere where the retort has been at work; and state who made the tests, and if they have been made since the difficulties referred to were overcome, if such have been overcome?

May 3, 1894. Gas Manager.

Gas as a Fuel.

Sir,—Mr. Fletcher's letter on the above subject in your last issue is interesting solely from the fact that it emanates from a firm which affords a striking example of one of the few exceptions to the rule laid down in my previous letter as to the position occupied by the vast majority of owners or inventors and their appliances. Mr. Fletcher naturally, therefore, recognizes no necessity for any alteration in the existing condition of affairs, which would divert the trade to its proper channels, and thereby create what you, in your comments in the Journal for the 24th ult., admitted was now lacking—namely, an open market. Instead of the present monopoly of supply by the few favoured manufacturers, I advocated a system which would enable "the many" to carry on a lucrative business to their own and the public benefit.

The writer, however, entirely fails to controvert my statements—merely remarking that they are not "sufficiently comprehensive," but omitting to indicate in what respect; and adding comments of a personal nature which would, if discussed by me, narrow the issue to an individual case. This, being far from my expressed object, which is the discussion of a broad question affecting four great interests, I must decline to do—simply stating, however, with regard to the first remark, that it is obviously true, inasmuch as my suggested remedy included the continuance of the hiring department by the companies; and, in the joint interests of the public and myself, I would naturally regret exclusion from the lists, which should comprise the best appliances. As to the second, I, in common with all interested in this subject, am well aware of the *sine quâ non* in construction necessary (especially from the companies' view) in an appliance for hire; and, notwithstanding the allusion to "fancy glass-work," I am satisfied that in this respect the "L. W. Leeds" stoves are now perfectly suitable. Considering the amount of attention I have given to this among other details, it is just possible that, under the circumstances, I may be a better judge of the efficient construction than Mr. Fletcher, whose attention, one would think, must be entirely absorbed in the contemplation of his firm's enormous variety, and therefore such a trifling matter as the variations for particular requirements in the patterns of an appliance less favourably situated than his own may have escaped his notice.

Mr. Fletcher's opinion as to the increase in trade through dealers other than gas companies is doubtless correct; and this is certainly, to a large extent, owing to the companies' efforts, for which all credit is due, as previously stated. But here again I contend that the only parties who benefit to any extent are these same monopolists, of whom Mr. Fletcher's firm is such a distinguished example; their profits by the trade with the companies affording them resources by which they are enabled to operate so extensively as to secure the bulk of the remaining trade—still sluggishly proceeding in the proper channels—to themselves.

The writer's concluding remarks as to patterns bear out my assertion as to the restricted selection accorded to the public by the hire-list. By Mr. Fletcher's figures, the proportion in the case of his firm's patterns is one-fifth of the whole; and certainly (as comprising a variety to the number of 86 in the firm's goods) should satisfy any ordinary customer, who, as a rule, is unaware of any possibly better system of heating or cooking being in existence. He therefore selects the appliance by its exterior only—taking for granted that the companies, as caterers to the public, provide the best to be obtained. But this is apparently only the nominal proportion, and is, in reality, seriously diminished if my assumption from Mr. Fletcher's words is correct—namely, that the 86 patterns mentioned comprise the total hired out by the aggregate of the companies with whom his firm has the privilege of dealing. In this case, considering the hundreds of companies, the average of these patterns to a single company would probably reduce the selection to a number easily counted on the fingers of one hand, and be represented by one-twentieth of the 86, or about 1 per cent., instead of one-fifth of the whole.

Reverting to the main question, one must assume, from the absence of comment by any of the numerous firms detrimentally affected by the existing circumstances, that the old lethargy still exists. But this does not alter the facts, which, if this unaccountable inertia were overcome, would be confirmed by the great crowd of those at present "spectators" only. Of the four interests which I specified, the first and third will apparently not move; and the second is powerless. There consequently only remains the fourth—*i.e.*, the public—which will certainly ascertain its disadvantageous position in the near future, and will, I believe, not hesitate to act promptly and effectually in asserting its rights. In these days the *raison d'être* of huge monopolies is being questioned on all sides; and it may be found, on full investigation, that the powers granted by charter to gas companies are by no means unlimited.

Beulah Hill, Norwood, S.E., May 2, 1894. Alfred Pullar, M.D.

The Electric Lighting Scheme for Bradford Out-Townships.—The Gas and Electricity Supply Committee of the Bradford Corporation have decided that the scheme for supplying the electric light to the out-townships shall be pushed on without delay. A deputation has also been appointed to visit the Halifax electricity works to inspect the process in use there for generating electricity in connection with the defecation apparatus; the idea being that the power necessary for the sewage works at Frizinghall should be similarly utilized.

Gas Workers' Hours at Rotherham.—According to the minutes submitted by the Gas Committee at the meeting of the Rotherham Town Council last Wednesday, a memorial had been received from the yardmen at the gas-works, asking for the working hours to be limited to eight per day; and the Committee recommended that the consideration of the question be adjourned until next meeting. This gave rise to a long discussion, which ended in an amendment granting the application of the yardmen being carried by eleven votes to nine. There will be no reduction in wages. The eight-hour day was conceded to the stokers in December, 1889; so that the system now obtains all through the works.

The Finances of the Rotherham Corporation Gas and Water Departments.—In submitting the estimates of the Finance Committee for the current year at the meeting of the Rotherham Town Council last Wednesday, the Chairman (Mr. Winter) referred to the deficits shown on the working of the Gas and Water Departments during the past year. He said, if the Gas Committee had not had to set aside the sum of £858 for the redemption of debt, and to give gas gratis for public lighting, instead of a deficiency of £2156, there would have been a surplus of £563. In the same way, if the Water Committee had not paid its instalments to the loan fund for the redemption of debt, there would have been a profit of £284 in place of a loss of £691.

Important Extensions at the Wolverhampton Gas-Works.—The Wolverhampton Gas Company have commenced making some very extensive additions to their works. The site of the operations is in a meadow adjoining the north side of the Stafford and Birmingham Canal at the rear of the present works, and in close proximity to the London and North-Western Railway. Altogether about three or four acres of land will, in course of time, be utilized for an additional gas-holder, retort-houses, and other necessary buildings. It is also proposed to construct a canal basin for the purpose of unloading boats; and an extra line of branch railway from Bushbury Junction is in contemplation. The gasholder, which is to supplement the four existing ones at the Stafford Road works, is receiving first attention; and the excavation for the tank is already well in hand.

The Gas and Water Accounts of the Clitheroe Corporation.—The abstract of the Clitheroe Corporation accounts for the financial year ended March 25 last has been issued by the Borough Treasurer. The publication of the accounts has been awaited with rather more than usual interest, because it was feared that there would be a very considerable loss on the Gas Department. The gas-works capital account shows that there has been an expenditure during the year of £388 on new purifiers and an additional bed of retorts; and £200 for service-pipes and mains. As to manufacture, the expenditure on coal and cannel was £2555; the cost of carbonization (including the wages of stokers), £323; and repairs, &c., £470—making a total of £3434. The distribution expenses came to £226; and the management disbursements, to £316. The sale of gas realized £4563; the rent of meters, £167; and the residual products, £1099—leaving as net revenue £1659. Out of the net revenue, the annuities representing the purchase-money—amounting to £1316—were paid; but the sum was not sufficient to meet all the payments, and £315 had to be taken from the depreciation fund, which now stands at £181. The loss on the department for the year was therefore £315. The water accounts are more satisfactory than they have been since the new reservoir was constructed; and they show a profit of £111, whereas last year there was a loss of £21. The amount paid as water annuities is £1250; and the total of the water-rents was £2643.

Payment of Wages during Illness.—At the Westminster County Court last Wednesday, the case of *Haloran v. The Gaslight and Coke Company* came before his Honour Judge Lumley Smith, Q.C. It was an action brought by James Haloran, of Canning Town, a gas stoker, to recover from the Company wages which he alleged were due to him. Mr. W. Thompson appeared for the plaintiff; Mr. Horace Avory represented the defendants. Plaintiff's case was that while he was working at Beckton he met with an accident through a defective fender on Sept. 20, 1893. He did not bring an action under the Employers' Liability Act, but went on his club for a month. On Oct. 20 he returned to work, but was not well enough to keep on for more than a few days at a time up to Jan. 6 of the present year, when he announced to his foreman that he had declared off the club, and the foreman replied that he was to consider himself discharged. He summoned the Company in the Police Court, and obtained a week's wages in lieu of notice. He afterwards found, through the Gas Workers' Union, that he was entitled to wages while he was ill, notwithstanding that he had been paid by the club. Dr. Moir gave evidence as to plaintiff's inability to work. The defence was that it was the custom of the Company not to pay men while they were absent through illness. They contributed largely to the funds of the club from which plaintiff was paid while he was unable to work; and when offered light work on one occasion he refused to do it. After hearing Counsel, his Honour said the case was of great importance to the Company and their men; and it had been properly supported on both sides. The question about the week's wages in lieu of notice was settled by the Magistrate; and therefore he would not express an opinion upon it. The question was whether he was entitled to payment for the period when he was unable to work. He could not disregard the custom of the Company, and the verdict must therefore be for the defendants. His Honour granted costs.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress has been made with Bills:—

Bills presented and read the first time: Electric Lighting Provisional Orders Bills (Nos. 3 and 4), Gas Orders Confirmation Bills (No. 1 relating to Bolsover Gas, Earby and Thornton Gas, Ilford Gas, and Willenhall Gas; No. 2, relating to Newquay [Cornwall] Gas, North Bierley Gas, Uttoxeter Gas, and Worthing Gas), Water Orders Confirming Bill, relating to Bishop's Waltham Water, Blandford Water, East Surrey Water, Tilehurst, Pangbourne, and District Water, and West Cheshire Water.

Bills brought from the Commons and read the first time: Carshalton and Croydon Gas Bill, Paignton Gas Bill, Southend Water Bill.

Bill read a second time and committed: South Hants Water Bill.

Bills reported: Aberdare Local Board Water Bill, Abertillery Local Board Gas and Water Bill, Edinburgh and Leith Corporations Gas Bill, Kendal Corporation Gas and Water Bill, Millom Local Board Bill, Newcastle and Gateshead Water Bill.

Bill read the third time and passed: Bacup Corporation Water Bill.

Opposition withdrawn: Abertillery Local Board Gas and Water Bill.

HOUSE OF COMMONS.

The following progress has been made with Bills:—

Bills read the first time and referred to the Examiners: Bacup Corporation Water Bills, Swinton Local Board Bill.

Bill read a second time and committed: Colne Valley and Central Middlesex Water Companies' Bill.

Bills reported: London County Council (General Powers) Bill, Neath Corporation Water Bill.

Bills read the third time and passed: Carshalton and Croydon Gas Bill, Paignton Gas Bill, Southend Water Bill.

Petitions for inquiry into the working of the Metropolitan Gas Companies have been presented from the Holborn Board of Works and the Willesden Local Board.

The Hertfordshire County Council have withdrawn their petition against the Colne Valley and Central Middlesex Water Companies' Bill.

HOUSE OF LORDS COMMITTEE.

(*Before the Earl of* JERSEY, *Chairman; Earl* RUSSELL, *Viscount* POWERSCOURT, *Lord* ZOUCHE OF HARYNGWORTH, *and Lord* WELBY.)

Tuesday, April 24.

FALKIRK CORPORATION GAS BILL.—FALKIRK AND DISTRICT GAS BILL.

The above Bills came before the Select Committee to-day. The one promoted by the Corporation of Falkirk was to authorize them to construct and maintain gas-works, and supply gas within the borough and adjacent places, and to purchase by agreement the undertaking of the Falkirk Gas Company. The Company's Bill was for the dissolution and re-incorporation of the undertaking, with additional capital, and with power to manufacture and supply gas within the limits specified.

Mr. BALFOUR BROWNE, Q.C., Mr. CRIPPS, Q.C., Mr. BLENNERHASSET, and Mr. J. WILSON appeared for the Corporation; Mr. BIDDER, Q.C., and Mr. J. D. FITZGERALD, for the Gas Company; and Mr. LOCK, Q.C., Mr. RIGG, and Mr. G. A. R. FITZGERALD represented ratepayers and others in Camelon, Falkirk, and Larbert, and the Stirling County Council.

Mr. BALFOUR BROWNE, in opening the case for the Corporation, explained that Falkirk was governed by the Commissioners under the Burghs Police (Scotland) Act, 1892. At the last census the population was 17,312; and now it was about 18,500. The present Gas Company had no statutory powers; and there had been great dissatisfaction with the supply of gas by the Company, whose works were quite inadequate. The Committee were asked not to give the Company the Bill they applied for, but to grant the Corporation power to supply gas. At the same time, the Corporation were quite willing to purchase the works of the Company at a fair price. What that fair price would be, their Lordships were not in a position to determine; but it should be a moderate one. There was very little real opposition to the Bill, in which the Corporation proposed to supply gas of 20-candle power, and to charge for it a figure not to yield a profit, but at cost price; and, moreover, they proposed charging the whole district supplied on exactly the same terms as within the burgh. The Gas Company were opposing the Bill; but they were not objecting to sell. The question was one of price. Some ratepayers in the burgh had petitioned against the Bill; but they had no right to appear—being bound by the seal of the Corporation. The petitioning ratepayers from Larbert were in the same position, because it was not the practice of their Lordships to hear two Local Authorities representing the same district; so they must elect either to appear themselves or be represented by the County Council of Stirling. Even they, however, would benefit by the Corporation Bill, because the gas at present was dear and bad. If the Corporation could purchase the existing undertaking at a moderate price, they could put up the new works with capital which they could borrow at 3½ per cent., or thereabout, and so could produce better gas, and sell it more cheaply than a company could who wished to make profits for their shareholders. The Company had taken enormous prices from the consumers for the gas supplied. Had they paid 10 per cent., the Corporation would very likely have stepped in before now; but, instead of dividing the profit, they had "watered" their capital, spent money on unnecessary works, and now asked a ridiculous amount from the Corporation to buy them out.

The following evidence was then given:—

Mr. *J. Wilson*, examined by Mr. BLENNERHASSET, said he was Town Clerk of Falkirk, and Clerk to the Police Commissioners. He found that in most burghs in Scotland of similar size the price of gas was lower than in Falkirk, and for the public lamps was very much less. Until the 11th of November last, when he saw the advertisement in the local paper, he had no idea that the Gas Company intended to come to Parliament this session for an Act; and no intimation had been given to the Town Council before that date. He immediately summoned the Committee to which the gas question had been remitted; and he ascertained, by telegraphing to London, that they had still a week to give notice of a Bill on behalf of the Corporation. Although situated in the centre of coal-fields, the gas supplied by the Company was dear; the price during the last three years being 4s. 2d. per 1000 cubic feet. There was a petition against the Bill, signed by 223 ratepayers of the burgh; but of these 112 had withdrawn their signatures, 2 were not ratepayers, and 16 were shareholders in the Company. The ward meetings approved of the action of the Commissioners in resolving to undertake the supply of gas for the town. The population of Falkirk was rapidly increasing; and the valuation, which ten years ago was £44,700, was now £58,360. They would not, in the circumstances, have had time to adopt the Burghs Gas Supply (Scotland) Act of 1876; but their failure to adopt the Act did not prejudice the Gas Company, so far as he could see, because the Corporation were willing to acquire their undertaking on fair and reasonable terms, but not to pay on the nominal capital which had been created. The Corporation had made an offer in writing on the subject; and they were still prepared to abide by it.

In cross-examination by Mr. BIDDER, witness said he would not object to 10 per cent. being added to the value of the works for the worth of the business. At the end of 1890, the gas supplied by the Company was very bad, and it was likely enough that the consumption had then outgrown the capacity of the works; and he believed that the Company had spent a large sum in alterations, and in providing additional purifiers. The dissatisfaction with the gas began as far back as 1887; and then the Corporation began to consider whether it would not be better to have the supply in their own hands. They had put a sum of £120,000 into the Bill, because they did not know how much they might have to pay for the works, and because they knew it would be easier to obtain the money if they did not borrow up to the extent of their powers.

In further cross-examination, witness expressed the opinion that populous places outside Falkirk would not be prejudiced by the Bill; and but for the action of the Company in promoting their Bill, the Corporation might not have been before Parliament till next session. If the Corporation had not come to Parliament sooner with a Gas Bill, it was because they had been engaged upon other undertakings of a more urgent character. It was true the Corporation were seeking authority to supply gas whether or not they bought the Company's works; but, at the same time, they were asking power to buy the works, and had offered to do so. It would be within their rights, if the Bill passed, to erect their new works, compete with the Company, reduce them to bankruptcy, and then refuse to buy up their undertaking. But they had offered to purchase on fair terms; and their Lordships could put in a clause binding them to do so.

In re-examination by Mr. BLENNERHASSET, witness said the Corporation were willing to add an agreement to the schedule of the Bill, binding them to purchase the Company's undertaking on the conditions suggested in the letter from the Corporation, in these terms—

I am instructed by the Committee who have charge of the gas matters to make the following suggestions with the view of obviating the expense of a parliamentary contest. The Police Commissioners shall purchase the undertaking of the Gas Company at a price to be fixed by Arbitrators—one to be appointed by the Company, and one by the Commissioners, with an Oversman to be named by the Arbitrators. Of course, it is to be understood that the negotiations should not proceed on the subject of compulsory purchase, and that it would be open to the Commissioners to urge any objection to the consideration and suitability of the works and plant. It would require likewise to be understood that the purchase would be carried through only if the Commissioners obtain their Bill for statutory powers to purchase; and that the arbitration could proceed at once, or under an agreement to be scheduled in the Bill.

Mr. BLENNERHASSET: We offer to do this now.

Mr. FITZGERALD read the reply of the Company, which was to the effect that, while they had no wish to sell the undertaking, they were willing to consider any fair offer for its purchase by the Commissioners on the usual arbitration terms in such cases.

The CHAIRMAN: That is on the basis of compulsory purchase.

Mr. FITZGERALD said that was so—the terms fixed by Parliament in the Burghs Gas Supply (Scotland) Act.

Mr. *Storey*, Convener of the Gas Committee of the Commissioners, was then examined; and he generally corroborated the evidence given by Mr. Wilson. He said he believed the action of the Corporation was approved by the ratepayers.

Provost *Griffiths* also gave evidence supporting the Corporation Bill.

Wednesday, April 25.

On the resumption of the proceedings this morning,

Mr. *J. A. Molleson*, C.A., of Edinburgh, was examined as to the financial position of the Company. In answer to Mr. CRIPPS, he stated that the Company was founded in 1845, and was registered as a limited liability company in November, 1856. In that year the nominal capital was fixed at £4000, in 2000 shares of £2 each, of which 1401 shares, representing a paid-up capital of £2802 were issued. Between 1856 and 1868, the paid-up capital was increased to £3347; and in August, 1869, it was raised to £10,500. This was done by allotting £1918 in shares to creditors of the Company, and by allotting, without payment, 2618 shares as fully paid up to shareholders "in respect of net surplus profits amounting to £5236." This was a change from surplus profits to capital. In 1877 there was an issue of 1000 shares; bringing the capital up to £12,500. In 1879 there were negotiations to buy up the undertakings of the older Company; and in contemplation of that

purchase the capital of the Company was raised to £25,000. The attempt to purchase the old concern did not succeed; but in 1887 an arrangement was made for the amalgamation of the two Companies. The capital of the Joint-Stock Company was then increased to £40,000. The finding of the Arbitrators was that the value of the Company's assets was £23,128, and of the old Company's assets £13,310—in all, £36,438. For a cash contribution of £17,164, the shareholders held shares amounting to £36,438. This was about 110 per cent. of difference. It was either a remarkable increment of the value of the Company's undertaking, or it was a watering of the stock, in either instance to the extent of 110 per cent. In June, 1893, the paid-up capital was increased to £49,602. He had no information of the causes of the increase.

Mr. CRIPPS: Either large sums have been charged for gas, looking to the enormous profits made, or there is an inflated capital, and no real value for it. Is not this a case where the public interest requires that the supply of gas should pass into the public charge?

Witness: Of course, I do not know what prices were charged; but they seem to have been very profitable, if these increases of capital involve real value.

Cross-examined by Mr. BIDDER: Either the profits were realized upon sound accounting principles—and, if so, it was quite legitimate, not having been paid in dividends, for the shareholders to capitalize them—or they had not been arrived at on a correct system of accounting, and capital had been debited instead of revenue; and then the words "watering the capital" would be correct. He had no material, however, to go upon in suggesting that the Company might have placed to capital what ought to have been charged to revenue. If he were the Arbitrator, he might consider not only what the capital was, but what was the earning power of the Company.

Mr. *Henry E. Jones*, M.Inst.C.E., was the next witness. He said his conclusion was that, if there were no existing Company, the Corporation of Falkirk could build gas-works and supply the district for £30,000. Savings would be effected, because they could borrow the money at the usual rate—3½ per cent.—on £30,000, as compared with the 8 per cent. profit on a capital of £50,000 asked by the Company in their Bill. With single mains, there would be a saving of leakage; and in these and other ways £4127 would be economized annually on the gas supply—representing 1s. 6¾d. per 1000 cubic feet of gas. This was a hypothetical case, and assumed that the Company were out of the way. He had been refused admission to examine the Company's works. He did not think, however, that they represented the expenditure of anything like £50,000. His opinion was that the cost of gas-works in that part of Scotland should not exceed £500 for every million cubic feet of annual supply.

In cross-examination, witness admitted that, if he were the Arbitrator, he would look into the condition of the Company's undertaking—their plant and everything; and said a Corporation should not use the rates to start competition against an old-existing Company until every means had been exhausted for acquiring the undertaking of that Company at its true value.

Mr. *Charles Hunt*, M.Inst.C.E., and Mr. *F. T. C. Linton* followed; their evidence concurring substantially with that of preceding witnesses.

Mr. BIDDER at this stage of the proceedings offered a suggestion. The Corporation, he said, had stated that they were willing to recast their Bill so that it should be compulsory on them to buy, and on the Company to sell, the present gas undertaking; and that the terms of purchase should be settled by arbitration under the Lands Clauses Act. But the Corporation wanted to add words to the effect that the Arbitrator, in determining the price, was to do so by fixing the real value of the concern, "taking all the circumstances into account." He could not accept this; but he thought he could point out a way of reconciling their views. Of course, the Company's Bill could not be withdrawn, because the Corporation might drop their Bill, and then where would the Company be? But his learned friend's position against the Bill was that, if the Company obtained it, and had conferred upon them statutory powers, their undertaking would be more valuable, and the Arbitrator would allow the Company more for it. He (Mr. Bidder) was willing to make this arrangement: There should be a provision to the effect that the Arbitrator was not to give any consideration to the parliamentary status acquired by the Company under it, and that he should be allowed to add the costs of the Company obtaining their Act. It was really the Corporation's own clause he would accept, but leaving out the superfluous words.

Mr. BLENNERHASSET asked to have an opportunity for his clients to consider the suggestion.

An adjournment was accordingly made. On the return of the parties,

Mr. BALFOUR BROWNE said there was a chance of an agreement being come to. But in the meanwhile the parties were not at one; and it might save time, and obviate the necessity for taking further evidence, to give them until the next morning to see if they could come to terms. The real points they were fighting about were, first, whether the Company should have 10 per cent. *plus* the value of their works; and, secondly, the Company said that, if the Corporation did not give notice of their intention to purchase within twelve months, the Company should have their Act of Parliament. Now, the Corporation were willing to put into their Bill that they would purchase, and that the Company should sell upon arbitration terms; and, if so, there was no necessity for the Company to go on with their Bill at all. Yet the Company desired not only that they should have their Bill, but that the Corporation should pay the cost of getting it. This would be putting on the gas consumers of Falkirk the cost of a Bill they did not want, and were really opposing.

Mr. BIDDER said his learned friend had told the Committee that the Company asked a 10 per cent. excess. They asked no provision of the kind. They only asked what the Arbitrator cared to give them under the Lands Clauses Act. As for the cost of the present proceedings, the Company were properly there.

The CHAIRMAN said he did not think the Committee could give a direction to the Arbitrator as to costs.

Mr. BIDDER pointed out that, if he gave a provision that the parliamentary status of the Company should not be considered by the Arbitrator, the costs ought to be allowed. If the Corporation went to arbitration with the Company as a statutory concern, the Company would get 50 per cent. more; but if he agreed to ignore his parliamentary status, the costs should be conceded.

The CHAIRMAN thought the matter was one on which the parties ought to come to an agreement. In the event of the Committee deciding to put in an arbitration clause, they would not be disposed to limit the discretion of the Arbitrator by any restricting words; that was to say, the Arbitrator would have to exercise his judgment as to what would be a fair price, without any direction.

Mr. BALFOUR BROWNE said the Corporation would accept a clause to purchase the works, on terms to be agreed, if possible, and, if not, then to be settled by arbitration—the Arbitrator to take into consideration "all the circumstances of the case."

Mr. BIDDER submitted that these words would limit the Arbitrator.

The CHAIRMAN said Parliament had already indicated the lines on which purchase should proceed in cases of this kind; and the Committee would probably follow those lines. But he thought the parties ought to come together. Of course, the Committee could not express any opinion on the Company's Bill, which was not yet directly before them; but it would be rather an awkward matter to ask the Committee to pass two Bills on the same subject for the same district.

Mr. BIDDER said he would be content to leave the matter simply in this way—that the Company should forthwith sell, and the Corporation purchase, the undertaking of the Company under the Lands Clauses Act; and he would leave it to their Lordships to say whether the Company were entitled to ask the Arbitrator to take the costs into consideration, and whether the Company ought to keep their Bill alive.

The CHAIRMAN said the purchase would take place under the Lands Clauses Act without any explanatory words or directions; but the Committee did not see their way to deal with the costs.

Mr. BIDDER: I accept your Lordships' decision on these points; and I shall not oppose the Corporation Bill with the clause in it to that effect.

Evidence for the Corporation, as against the ratepayers' petitions, was then given; Mr. *E. H. Stevenson*, M.Inst.C.E., being called to show that ratepayers outside the burgh would not be injuriously affected, but would rather be benefited, by the Corporation taking over the gas supply.

The case for the County Council of Stirling was next heard.

Sir *J. Gibson Maitland*, Convener of the County and Chairman of the County Council, gave evidence in support of the wish of the latter to preserve the rights of populous places outside Falkirk, but within the district of gas supply. They wished, he said, that nothing should be done to prevent these places in the future undertaking their own lighting arrangements.

Counsel for the Falkirk Corporation agreed to various amendments on clauses, giving effect to the wishes of the Stirling County Council.

Witnesses having been examined in support of the petition of opposing ratepayers,

The CHAIRMAN announced that the Committee had decided to pass the preamble of the Bill.

Thursday, April 26.

To-day the Committee were engaged in the consideration of clauses. On the one providing for the purchase by the Corporation of the Gas Company's undertaking,

Mr. BIDDER asked their Lordships to make the clause clearer by inserting, after the words "the Corporation shall forthwith," the words "before commencing to supply gas under this Act," purchase the Company's undertaking, and so forth. It was, of course, understood that there was to be no competition—that the Corporation would buy at once, and that there was to be no setting up and starting works of their own to starve out the Company before purchasing. The words he suggested would make it clear that the Corporation should not go before the Arbitrator and say he must consider the value of the undertaking subject to the possibility of competition.

Mr. BALFOUR BROWNE objected to the words. He said their Lordships' decision was that the Arbitrator should be absolutely unfettered, that he should proceed under the Lands Clauses Act, and that the purchase should take place forthwith.

The CHAIRMAN thought that "forthwith" would be taken to mean immediately after the Corporation Bill became an Act.

Mr. BIDDER said that, if his learned friend gave him an assurance that the Corporation would not use the position given them by the Bill as gas suppliers to depreciate the Company's undertaking, he would rest content.

Mr. BALFOUR BROWNE said there could not possibly be competition, because to construct works would occupy at least eighteen months; and according to the clause in its present form, the purchase must take place "forthwith."

The CHAIRMAN remarked that the question was whether the words proposed expressed the intention of the Committee—viz., that the Corporation should proceed to buy the works directly their Bill became an Act. He gathered that this was also the meaning of the Corporation; and there could be no objection to the words suggested by Mr. Bidder.

Mr. BALFOUR BROWNE said the fear of the Corporation was that, upon these words, it might be possible to raise certain arguments before the Arbitrator, and represent to him that the Committee had recognized a monopoly in the Company.

After some consultation, the CHAIRMAN announced the decision of the Committee as follows: The Committee are of opinion that the words proposed by Mr. Bidder can be put in, because they carry out the intention of the Committee, and also, as I gather, the desire of the Corporation, and they are not words which bind the Arbitrator, but words which show that the first step to be taken by the Corporation will be the purchase of these works.

Mr. BALFOUR BROWNE: It not being intended to guide the Arbitrator, it will do.

Mr. BIDDER: That being settled, we withdraw our Bill.

Mr. FITZGERALD, on behalf of the Stirling County Council, said the arrangements made on the previous day satisfied his clients.

The remaining clauses were then adjusted, and the Bill was ordered to be reported to the House.

HOUSE OF LORDS COMMITTEE.

(*Before the Earl of* LAUDERDALE, *the Earl of* ROMNEY, *Lord* CAMOYS, *Lord* SINCLAIR, *and Lord* KELHEAD.)

NEWCASTLE AND GATESHEAD WATER BILL.

This Bill—which was promoted by the Newcastle and Gateshead Water Company to obtain power to abandon the construction of certain works authorized by an Act of 1889, to make a new reservoir at Catcleugh, and carry out other works, and to raise £500,000 of further capital, with additional borrowing powers—was recently for several days under consideration by the above-named Committee.

The promoters' case was stated by Mr. Bidder, Q.C., who explained that, when the Company obtained their Act in 1889, they did not realize the extent to which the population was growing; and subsequent experience had shown them that the reservoir of 40 million gallons capacity then authorized would be inadequate to carry them through any long series of years, if the population went on increasing. In that Act, a clause was inserted providing that the Company should not take water from the river for storeage in the reservoirs, except the surplus above a flow of 4½ million gallons a day in February, March, and April, and 2 million gallons a day in the other months. In the present Bill, they proposed to give compensation, and thus to guarantee that at no time should the water in the river be less than the quantity named. The estimated cost of the proposed works was £500,000. The Bill was opposed by the Duke of Northumberland, who was the owner of a portion of the land within the drainage area which was to be taken for the purposes of the reservoir; and the aqueducts would be constructed through his land. But any way in which his Grace was injuriously affected could be met in the usual manner by compensation. The same observation would apply to the objections of the other riparian owners. The Conservators of the Tyne had petitioned against the Bill; and, in regard to their request, he might say that the Company were willing either to give the £3000 odd agreed to in 1889, or the extra compensation water now proposed; but they could not give both. The opposition of the Newcastle and Tynemouth Corporations was merely on matters of clauses.

Evidence was then given in support of the Bill. The first witness called was Mr. L. W. Adamson, J.P., one of the Directors of the Company. He stated that, when they applied for their Act in 1889, they were under the impression that the amount of reservoir accommodation then proposed would be sufficient; but now they thought it would not. The works proposed were necessary for the future supply of the towns; but, from a Conservator's point of view, he considered the Company should give not only the amount provided under the Act of 1889, but also the compensation water proposed in the Bill. Mr. C. F. Hamond, M.P., Chairman of the Parliamentary Committee of the Newcastle Corporation, stated that, as a resident in Newcastle for upwards of half-a-century, he knew the wants of the city. Last year the water supply became very short, and great alarm was felt in consequence. It was generally thought that there was a most urgent necessity for the Company to have an additional quantity at their command. Their Bill had been approved by the Corporation, with certain alterations. At present the Company were restricted in regard to their supply to North Shields, if the quantity required for Newcastle and Gateshead reached a certain limit; and he considered that on no account should this restriction be removed. The Corporation would object to any arrangement with the North Shields Company which would endanger the supply to the promoters' own district. Mr. Alderman Hindmarsh gave corroborative evidence as to the shortness of the supply of water last season; and the Mayor (Mr. S. Quin) stated that the Corporation had strongly urged the Company to apply to Parliament for further powers. They approved of the provisions contained in the Bill, with the exception of those relating to the supply of North Shields. This point, however, had been settled by a Committee. Personally, he would be willing for North Shields to be taken within the limits of supply, on condition that the Company arranged to furnish a certain quantity of water to Newcastle and Gateshead, calculating the probable increase of population. The Secretary of the Company (Mr. G. Smith) gave statistical evidence as to their position and limits, and said that, if they were put under compulsion to supply North Shields with more water than at present, it would involve the outlay of considerably more capital.

Mr. Freeman, representing Mr. Bates, a mineowner, addressed the Committee on behalf of his client, with the view of ensuring his mine being protected against flooding by the bursting of the Company's pipes; and evidence was given on this point. Mr. Rickards then called witnesses on behalf of Mrs. James and certain trustees of the Otterburn Estate; and he asked the Committee not only to increase the compensation water to 5¾ million gallons, but to give her the right to prove and claim compensation for depreciation of the letting value of the estate by reason of injury done to the fishing in the River Rede by the impounding of water under the provisions of the Bill. Mr. Sheridan Holmes expressed the opinion, as an engineer, that it would be possible to obtain a sufficient supply of water for Newcastle without constructing the proposed reservoir, if the Company would only increase the size of their conduit. Mr. Page asked the Committee to insert in the Bill a provision compelling the Company to supply the inhabitants of North Shields and Tynemouth with 20 gallons of water per head per day. The Town Clerk of Tynemouth (Mr. H. A. Adamson) expressed the opinion that, when the Company were in possession of the additional water sought by the Bill, they ought to be called upon to supply Tynemouth and North Shields with a larger quantity. In cross-examination on this point, he admitted that at present the North Shields Company were not entitled to require the Newcastle Company to supply them with water when the minimum was less than 500 million gallons. But he said that this restriction now applied only to five months in the year; and it was sought, under the clause proposed to be inserted in the Bill for the protection of the Newcastle Corporation, to make it apply to the whole year. To this he objected. Mr. Spence, Surveyor, of Tynemouth, gave it as his opinion that the clause would have a most injurious effect upon the people of Tynemouth; but, though he did not approve of it, he would be prepared to submit to it if its operation were postponed until after the new supply had been obtained.

The Committee were then addressed by Mr. Littler, Q.C., on behalf of the Duke of Northumberland. Counsel asked that the promoters should be compelled to enter into a contract to supply his Grace with an adequate quantity of water at a reasonable rate for the purposes of the tenants on his Tynemouth property. Mr. E. G. Wheler, his Grace's commissioner, spoke of the injurious interference to the property which would be caused if the Water Company were permitted to submerge his grazing land at Catcleugh and to destroy his shooting-box. The Duke was the owner of 600 acres of land in Tynemouth, where he had 345 houses, and had sold 266 others upon perpetual ground-rents. He also owned other houses in townships outside the borough; and it was of the utmost importance that these should have an adequate supply of water. The Company had laid out their line of pipes without any consideration whatever for the Duke's convenience. With regard to the compensation water to be sent down the river, he asked the Committee to fix the proportion, and require that the amount should be arrived at by means of gaugings taken during the construction of the works. If his Grace could get a compulsory supply of water from the Newcastle Company, he would not desire to make any profit out of it, but would be prepared to transfer the contract either to the North Shields Company or to the Corporation of Tynemouth. If it was handed over to the North Shields Company, it might, perhaps, slightly increase the value of the Duke's holding in that concern. His Grace had not received a shilling of the £7000 compensation awarded to him under the Act of 1889. Mr. G. H. Hill, M.Inst.C.E., agreed with the suggestion as to the manner in which the amount of compensation water should be arrived at. With the imperfect data at his disposal from the materials laid before the Committee, he had suggested that 5 million gallons of compensation water should be given for three months in the year, and 2 million gallons a day for the remaining nine months; or 2¾ million gallons a day for the whole year. In his view, the alternative suggested by the Newcastle Corporation, that there should be a supply of 25 gallons per head per day if the total supply amounted to 800 million gallons, was a fair one.

Counsel having addressed the Committee, the Chairman announced that they had decided to allow the Bill to proceed, on the following conditions: (1) The agreement with regard to the payment of £3850 to hold good. (2) The clauses proposed by the Board of Trade to be inserted. (3) The amount of compensation to be 4 million gallons per day; but, in the event of the promoters not assenting to this, they may fall back upon one-fourth of the average of the next seven years' rainfall, the gaugings of which are to taken hereafter. (4) North Shields to continue, for the present, to be supplied under the Act of 1889; and, when the new works are completed, they are to be supplied from them. (5) A bursting clause to be inserted for the protection of Mr. Bates; and the penalty to be increased from £25 to £200 a day. (6) The two farms on the Pawson Estate, amounting to 5500 acres, to be bought outright. The Committee were of opinion that the case of Mrs. James had been sufficiently met.

A day was allowed for the consideration of the foregoing conditions. Upon the re-assembling of the Committee, Mr. Baggallay, on behalf of the promoters, expressed their willingness to accept them. They would adopt the alternative suggested by their Lordships with the view of arriving at the amount of compensation water to be given, by agreeing that it should be calculated upon the basis of the rain gaugings of the next seven years, in preference to absolutely fixing the quantity of compensation water at 4 million gallons. They had inserted a clause which they considered would meet the point raised with regard to Pawson's Trustees, compelling the Company to buy the whole of the two estates, if required to do so in writing within two years of the passing of the Bill. To meet the case of Mr. Bates, they had inserted a bursting clause which compelled the Company to pay such compensation, failing agreement, as should be determined by an arbitrator to be appointed by the Board of Trade, for any damage ensuing from the bursting or leakage of the pipes. Mr. Littler, on behalf of the Duke of Northumberland, proposed to ask that the compensation water should be secured to his Grace, as Trustee for the North Shields Water Company, unless the Committee had already considered the question. The Chairman said they had considered it; and it would have been mentioned in their decision if they had had any intention of the sort. Mr. Littler said under those circumstances he would reserve his opposition on the question until the Bill was before the House of Commons. He then asked that the Committee would not allow any existing agreements with his Grace to be abrogated. The Chairman said the Committee had no wish to abrogate them, unless they were inconsistent with the decision they had given. A desire was then expressed by several Counsel that provision should be inserted, securing to the parties they represented money compensation, in addition to water compensation, for injury to their respective properties. This was, however, opposed by Mr. Baggallay; and the Committee declined to accede to the request. Nor would they grant compensation to Mr. Bates for any injury caused by the laying of the promoters' pipes through his land; but merely for damage arising through the bursting or leakage of the pipes. On the clause proposed to be inserted for the Corporation of Newcastle, Mr. Page, on behalf of the Corporation of Tynemouth, said that, as drafted, it did not carry out the decision of the Committee, which was to the effect that the North Shields Water Company were to be supplied under the Act of 1889 until the works authorized by the present Bill were completed, and that then they were to come under the new clause. The Chairman repeated that the intention of the Committee was that the new clause should not come into operation until the works now to be authorized were completed—not when the Company began to take water from the Rede. After some discussion, the clause was amended so as to provide that it should not come into operation until the Catcleugh reservoir was completed, and the Company had commenced to take water therefrom for purposes of supply. The remaining clauses having been disposed of, the preamble of the Bill was formally proved; and the Bill, as amended, was subsequently reported to the House.

HOUSE OF COMMONS COMMITTEE.

(*Before Sir* JOSEPH PEASE, *Chairman*; *Mr.* BRUNNER, *Mr.* BAIRD, *and Mr.* RANKIN.)

Tuesday, April 24.

WEST MIDDLESEX WATER BILL.

At the close of the inquiry into the East London Water Bill, reported last week, the Committee proceeded to the consideration of the West Middlesex Water Bill, which proposes to raise £500,000 further capital for the construction of additional works.

Mr. PEMBER, Q.C., and Mr. RICKARDS appeared as Counsel for the promoters; and the petitioners against the Bill were represented as follows: The Corporation of London, by Mr. LITTLER, Q.C., Mr. RIGG, and Mr. E. BEARD; and the London County Council, by Mr. COHEN, Q.C., and Mr. FREEMAN.

Mr. PEMBER, in opening the case for the promoters, said that in this, as in the last case, the Company proposed to raise £500,000 at 4½ per cent., with the same auction premium and sinking fund clauses. They required the money for storeage reservoirs, filter-beds, and mains. In the first place, they proposed to purchase a small reservoir belonging to the Grand Junction Company, which would cost them £26,000; and for engines and mains in connection with that reservoir, they would spend £19,000. They also proposed to construct six acres of filter-beds, at a cost of £60,000. Engines and engine-houses for general purposes would cost about £75,000; and pumping mains and the laying of the same, about £80,000. On the ordinary extension of the service-mains, they proposed to spend £60,000; and on a tunnel and mains under the river at Hammersmith, £20,000. This left £30,000 for contingencies, or for working capital. The Company would begin with certain works, which would involve an expenditure directly of very nearly £300,000 out of the £500,000; and the remaining works would be finished within any time between six and ten years. The works were rendered necessary by the increase in the supplies, which had gone up 31·3 per cent. since 1881. While the quantity of water pumped had increased by 62 per cent. in twenty years, the storeage had risen only 28 per cent., and the filter-beds 50 per cent. The same result was shown to have taken place in the engine power; and the consequence of all this was that he must admit the Company were below what they ought to have done in the way of increasing their storeage and filtering power. The Local Government Board had been pressing the Company since 1891 on the question of satisfactorily dealing with the water taken when the Thames was in flood; and the Metropolitan Water Examiner reported the necessity of making such additions to the works as would enable them to supply water of better quality at such times. The present proposal need not interfere with any scheme that there might be for the general storeage of the water of the Thames. If the general scheme for storeage shadowed forth by the Royal Commission, or by Messrs. Hunter and Fraser's plan, or whosever scheme it might be, were to go on to-morrow, and the West Middlesex Company were to join in it, it would only diminish the size of the storeage reservoir which they proposed to a certain extent, and save them £60,000 out of £500,000; but inasmuch as it was a far cry yet to the general storeage scheme, it was quite clear that the Company must be prepared to go on with their own private proposal. The reservoirs would be constructed on the Company's own land, of which they possessed 140 acres available. The Company's district extended 27 square miles, of which only 9½ miles were within the London County Council's area. The learned Counsel then proceeded to comment upon the County Council's petition, which alleged that, in consequence of the non-deposit of plans and sections, they had been unable properly to investigate the nature and extent of the proposed works; and explained that the Standing Orders only required that plans and sections should be deposited in the case of compulsory powers over land being sought. In this case, the proposed works would be all upon the Company's own land; and with the capital which the Company asked for, they had abundant power to do everything proposed to be done. The County Council also sought to prevent the Company having the money, lest it might interfere with something which they might feel inclined hereafter to do; but as the Committee had heard so much about that in the last case, he thought it would not be fair to inflict upon them any further observations on that subject.

Thursday, April 26.

Mr. *F. H. Wybroo,* the Secretary of the Company, examined by Mr. RICKARDS, said that he had been in the service of the Company for 25 years. The whole of the authorized capital had been raised; and the capital balance in hand amounted to £19,000. The Company had agreed to purchase the Shoot Up Hill reservoir from the Grand Junction Company; and the purchase-money and works in connection with that reservoir would cost something like £45,000, which would overdraw the balance by £26,000. With the exception of a small covered reservoir at Willesden, there had been no expenditure on storeage or subsidence reservoirs since 1881. A very small filter-bed was constructed in 1886. There had been, and still was, a large increase in the supplies—mostly outside the county of London. At the end of 1893, the average daily quantity of water supplied by the Company was 18,708,000 gallons, as against 14,791,509 gallons in 1886, and 11,528,835 gallons in 1881. It was in order to meet the increasing demand that the Company were now asking Parliament for power to raise the additional capital for adding to the storeage capacity and the filtration area, and for mains and engines for pumping the additional water. In 1891 the Company were pressed by the Local Government Board, in consequence of the report of the Water Examiner, to make additions to their works; but owing to the proceedings in Parliament by the Vestries and the County Council on the water question, the Company had delayed introducing a Bill. The time, however, had now arrived when it was absolutely necessary that the question of providing additional storeage reservoirs and filtration works should be no longer postponed, in the interests of the consumers as well as those of the Company.

Mr. RICKARDS: It is obvious, is it not, that it is not of advantage to the present proprietors that further capital should be raised?

Witness said the present proprietors could not get any more than they had been for some time past, receiving. It was solely to provide the supply that was demanded by the increasing number of new houses, and to enable the Company to fulfil their statutory obligations with regard to water supply, that the additional capital was sought. For 13 years the dividend was a very small one; but the full 10 per cent. was now paid. A rebate of at first 6½ per cent., and then 7½ per cent. was also granted to the consumers; and this next Midsummer would be increased to 10 per cent. The Directors had limited the amount of capital which they asked for to the lowest scale consistent with fulfilling their obligations; and they would have only £30,000 left for contingencies.

Mr. COHEN cross-examined witness on the report which the Company laid before the Water Commission, as to the result to the Company if they were called upon to execute unremunerative works, and asked if the works now proposed would be remunerative.

Witness replied that part of them would be remunerative works, as they were to provide for the new supplies. The object of the statement to the Royal Commission was not to convince the Commissioners that they did not require any additional provision for the storeage of water such as might be needed in 10, 15, or even 20 years. The statement submitted to the Commission contained these words: "All the works hereinbefore described are in a thoroughly efficient and good condition, and capable of meeting all demands for the present and in the future, by extension and improvements from time to time." This showed that additions were contemplated from time to time. He did not remember any request from the Royal Commission asking to be supplied with details of what additional storeage works would be required for the supply of a certain quantity of additional water.

Mr. COHEN: In constructing these works, was it your intention to follow the recommendations of the Royal Commission?

Witness said the works for which they were applying for capital were required independently of the report of the Royal Commission. At present the Company had only six days' storeage; and the Water Examiner and the Local Government Board had been urging on the Company for several years that this should be increased. General Scott said that every Company ought to have from 15 to 20 days' storeage at least. The proposed works would give storeage for 300 million gallons, which was equal to 20 days of their present supply, and would suffice, in his opinion, for a period of ten years.

Cross-examined by Mr. RIGG, for the Corporation of London, witness stated that the Company's reserve fund was a very small one—only £20,000. Prior to granting the rebate, which commenced in 1887, there had been an accumulation of capital for some considerable number of years; but the revenue itself was not sufficiently large then to admit of the rebate being made. He did not think there would be any objection to the insertion of a clause in the present Bill, as was done in the Company's Act of 1891, allocating the amount of capital which was raised to particular works.

In re-examination, witness stated that the Chairman of the Company, when before the Royal Commission, pointed out that the Company then required more storeage capacity, and that they were very anxious to provide it. In addition to the reserve fund, there was an undivided amount of £109,000, which was shown in the reports to the Local Government Board. Having regard to the very small amount of the reserve fund, it was considered advisable always to have other funds in hand to meet contingencies; and he regarded this as a great advantage. The item of £50,000, for the extension of the ordinary services, was calculated at the rate of £5000 a year for ten years, which was about the amount that they had actually spent each year for that purpose since 1869.

In reply to the COMMITTEE, witness said that the Company were under public control with reference to the processes of subsidence and filtration; because since 1871 there had been a Water Examiner appointed by the Government, who came to the Company's works whenever he liked, and who made a monthly report to the Local Government Board. It was pointed out to him that in the report he would find the Commissioners said: "It does not come within the terms of our reference to lay down what should be the exact regulations as regards filtration;" and, on being asked if there were any public regulations with regard to filtration, he replied that he did not know there were. Asked if his Company considered the recommendation of the Commission that regulations on these matters should be drawn up after competent inquiry, and be strictly enforced, witness said they had considered it so far as this—that, when they were drawn up by the Government, the Directors would endeavour to carry them out in the best way.

Mr. *M. W. Hervey,* M.Inst.C.E., Engineer to the Company, examined by Mr. RICKARDS, said that General Scott had always had access to the works for the purpose of seeing that filtration and subsidence were properly carried out. The Board would treat any opinion which he might express with reference to the filtration of water with great deference. Although he had no legal right to enter the works, he could do so at any time he pleased, and very often without notice; and he would be furnished with samples of the water. Proceeding to give a description of the Company's works at their intake from the Thames at Hampton, witness said the water gravitated from the river to the engine-wells through two 48-inch cast-iron pipes. They had one Cornish engine of 120-horse power, and a horizontal compound Worthington engine of 220-horse power, and a triple-expansion vertical Worthington engine also of 220 horse power, which enabled the Company to pump in the course of 24 hours 59,750,000 gallons; but the engines were in duplicate, and they only worked one of the Worthingtons at a time, capable of pumping 24,500,000 gallons. These engines pumped the water into the reservoirs at Barnes, a distance of 8½ miles. At Barnes, the works consisted of subsiding reservoirs, capable of storing 117½ million gallons, and 15 acres of filter-beds. The water passed into the reservoirs, where the particles in suspension subsided. The water was then drawn off on to the filter-beds, through which it passed; and gravitating thence to the engine-wells at Hammersmith, it was pumped into the district.

Mr. RICKARDS: It is of importance, in view of possible obstruction occurring between the point of intake at Hampton and the reservoirs at Barnes, that you should have ample storeage at Barnes?

Witness: It is an absolute necessity.

Examination continued: The filtered water was conveyed through two 36-inch cast-iron pipes to the engine-wells at Hammersmith. The engines there consisted of Cornish, Worthington, and compound fly-wheel engines, capable of dealing with 35,877,280 gallons; but necessarily a great deal of it was reserve power. From these pumping-engines, the water was conveyed into the district by three 30-inch, two 21-inch, and one 10-inch main. The 30-inch mains had to take the water a distance of three miles from the works; and it was then carried on by two 36-inch main. In addition to the reservoirs at the pumping works, the Company had storeage reservoirs having a total capacity of 13,422,000 gallons; and the additional capacity afforded by the Shoot Up Hill reservoir was 6,000,000 gallons—making altogether a service reservoir capacity of 19,422,000 gallons. At Barrow Hill, the Company had three engines—two single-cylinder beam engines and one compound horizontal engine—which were capable of pumping 5,175,000 gallons in 24 hours. They pumped through one 16-inch main and two 15-inch mains. The total amount of land now possessed by the Company was 96 acres 3 roods; but at the present moment they only had spare land to the extent of 8 acres 3 roods. It was sought by the Bill to obtain power to construct upon 140 acres of land at Barnes, closely adjoining the existing works of the Company, storeage reservoirs and filter-beds. The estimated cost of the storeage reservoir at Barnes, which would contain 300,000,000 gallons, was £140,000. For the supply of the reservoir acquired from the Grand Junction Company, at a cost of £26,000, it was necessary to put up certain engines and mains, which would cost £19,000. During the next ten years or so, they would require six acres of filter-beds, which would cost £60,000; engines and engine-houses, £75,000; large pumping-engines, and expense of laying the same, £80,000; and the ordinary extension of services and small mains in the district for the general increase of supply, £50,000. From the reservoir at Barnes to the pumping-station at Hammersmith, it was proposed to convey the pipes which carried the water in a subway under the Thames—a considerable improvement upon the present plan of laying the pipes actually in the bed of the river. For this he allowed the sum of £20,000; making a total allocated capital of £470,000, and leaving a margin of only £30,000 for contingencies.

Mr. RICKARDS: Is one of the objects of the Bill to raise your present storeage capacity from about six days' up to a much larger number of days' supply?

Witness: Yes. When the reservoirs that we propose are complete, we shall have, at the present rate of consumption, 20 days' storeage, which is the amount recommended by General Scott.

In laying out these works, have you had due regard to the recommendations of the Royal Commission?—Yes, I think quite.

Examination continued: The constant supply in the Company's district had, in the course of the last few years, been compulsorily increased under the orders of the London County Council. The total number of constant supplies at the end of 1893 was 43,628, out of a total number of 76,694 supplies. This undoubtedly had the effect of increasing the consumption of water, not necessarily through the fittings so much as by the people who used the water purposely letting the taps run to cleanse the drains. In the case of garden supplies, too, pipes were left running all night long in hot summer weather; and in time of frost, people left their taps open for the purpose of preventing the pipes freezing. If it was an intermittent supply, of course they would merely exhaust the water in the cisterns, and have to go without more until the next day. Owing to the demand made upon the Company by the County Council that they should provide a constant supply, it was necessary to obtain additional storeage capacity.

In answer to the COMMITTEE, witness stated that in the year 1893 the supply per head was 32·9 gallons.

Mr. RICKARDS: What amount have you expended on filter-beds between 1881 and 1891?

Witness: £62,778.

Mr. PEMBER: That is just £2000 more than we propose for filter-beds in the next decade.

Mr. FREEMAN (in cross-examination): When you were before the Water Commission, did you suggest anything to qualify the statement that, without any further storeage at all, you could take an ample supply of water from the Thames?

Witness: The making of additional storeage reservoirs has been always contemplated by me throughout. I think I alluded, when I was before the Royal Commission, to the want of capacity of the subsidence reservoirs.

The CHAIRMAN: You are quite right in cross-examining to show that the storeage is sufficient at the present moment; but I would point out that you are examining upon a report of 1892, when the quantity of water supplied was 16,000,000 gallons, and they have now got to 18,000,000 gallons with the storeage they had in 1892.

In further cross-examination, witness said his Company were fully prepared to contribute towards the Staines scheme, quite irrespective of the reservoirs which they proposed to construct at Barnes.

Mr. FREEMAN: If the Staines scheme were carried out, would it not render some of the expenditure which you are asking for power to make under the Bill unnecessary?

Witness: I do not think so.

When Mr. Pember said that, at least to the extent of £60,000, these works would be unnecessary if the Staines scheme were carried out, you did not agree with him?—I do not think it was intended in that way at all. Mr. Pember may have taken it so; but that was not our intention.

There is no doubt, is there, that, as regards the purity of the river, the Staines site is a very much better one than where you are proposing to erect your works?—It appears to me that it is a mere question of scientific knowledge. Some of the scientists go so far as to say that the water is better at Hampton than it is at Staines.

You are perfectly aware that, in the report of the Royal Commission, certain restrictions were laid down that the Companies were not to take water at the top of the flood, or with a certain minimum quantity of water in the river. Should you be content that those terms should be put upon your Company as regards this reservoir?—That is one of the great objects of this reservoir—to avoid as much as possible taking water at the time of the flood, and also to help us at the time of minimum flow. But if we have no further storeage than we now propose for the additional 300,000,000 gallons, that would not preclude the necessity of our taking water from the river in a time of long flood.

Then I may take it that, even if the Committee grant all you are asking under this Bill, you will still be unable to comply with the conditions under which alone the Royal Commission said that future storeage should be allowed?—Not entirely.

Sir *F. Bramwell*, F.R.S., examined by Mr. PEMBER, said that, knowing the requirements of the West Middlesex Company, he did not consider they had gone beyond the recommendations of the Royal Commission in the amount of storeage and filtration which they proposed to supply—especially bearing in mind the fact that they had no supply from wells, and that they were dependent entirely upon the river water. With regard to the relations which should exist between the storeage and filtration of water, his views were that the less the storeage, the larger the filtration power should be. Filtration depended upon the quantity to be supplied daily, and upon the condition of the water when it came upon the filters. Storeage was with the object of not taking in the worst water of the Thames, of giving the water time to settle, and of bringing that improved water on the filters, so as to make the filters more able to do their work. The action and reaction between the filter-beds and the storeage reservoirs was very necessary to keep up. In his view, it would not be a wise thing for the Company to consent to cut their scheme into two, and only make two parts of their four-compartment reservoir at one time, and the others afterwards. If their powers were limited to two or three of the four compartments, they would have to come to Parliament again shortly for another Act.

Mr. COHEN having addressed the Committee on behalf of the London County Council in opposition to the Bill,

Mr. RIGG, for the Corporation of London, said he was not prepared to call any evidence to show that the works were unnecessary, or that the estimate was excessive; and in these circumstances he did not propose to take up the time of the Committee in commenting upon the evidence which had been given.

The Committee then deliberated in private; and on the re-admission of the parties,

The CHAIRMAN said: We have come to the conclusion to pass the preamble of this Bill; and we are influenced very much by the consideration that the public convenience and the public safety—especially in such times as we are living in, with cholera at our doors—are best promoted by a considerably increased power of storeage and filtration. But still we wish to put in the same reservation as we did in giving judgment on the East London Bill—namely, that we do not wish in any way to prejudice the question of the acquirement of the water supply of London and the district by a competent water authority. We propose to ask that such a clause as is referred to in the Board of Trade report should be brought up, allocating the expenditure to the different works contemplated in the Bill. Then, of course, when we come to the clauses, there will be the much larger and more important question of the sinking fund.

The Committee then adjourned.

A Heavy Sentence for Stealing Gas.—It is reported that at the Jersey Criminal Assizes last Wednesday, a French chemist, named Edmund de Rentz, was sentenced to four months' imprisonment with hard labour, to be followed by five years' banishment from the island, for using pipes so fixed as to supply gas which was not registered by the meter, and was accordingly not paid for.

The Bury Corporation and the Supply of Water to Haslingden.—As mentioned in the JOURNAL last week (p. 796), the Police and Sanitary Regulations Committee of the House of Commons passed the preamble of the Bill of the Bury Corporation, in which they asked for an extension for three years of the period within which they are required by their Act of 1889 to supply water to Haslingden. The Committee, however, granted only two years for the completion of the works; at the same time suggesting that further measures should be undertaken, in order to give Haslingden the water to which it was entitled.

Harrow and Stanmore Gas Bill.—It was recently intimated in these columns that the Harrow Local Board had withdrawn their opposition to this Bill. Before doing this, however, we understand that they practically obtained all they had been fighting for; and the Gas Company agreed to pay £200 of their costs. By the arrangement entered into, the consumers within and beyond the one-mile radius will secure a reduction in the price of gas of 3d. per 1000 cubic feet, commencing the first quarter-day after the Royal Assent is given to the Bill. The illuminating power is to be raised from 14 to 15 candles; the Local Board asked for 16 candles, but yielded the one point. The Company themselves inserted the auction clauses in the Bill, and agreed to the sliding-scale, as asked by the Local Board. The capital which it was sought to raise was reduced. The Company desired to be authorized to raise £60,000, and to borrow a further £17,000; the agreement puts it at £40,000 and £15,000 respectively.

Sales of Shares.—At a public sale at Maidstone last Thursday week, fifteen 7 per cent. shares in the *Maidstone Water-Works Company* realized £17 10s. each; ten similar shares were sold for £17 15s. apiece; while five other shares of a like value fetched £18 5s. each. Two 4 per cent. preference shares in the same Company were knocked down at £12 each.——Last Tuesday, Messrs. Hollis and Webb sold at Leeds £215 7s. 4d. original 10 per cent. and £340 7 per cent. stock in the *Calverley and Horsforth District Gas Company* for £895; and ten £5 shares in the *Mirfield Gas Company* for £12 each.——The *Mirfield Gas Company* have just issued by tender 500 new ordinary £10 shares (bearing a nominal dividend of 7 per cent., with the sliding scale); and they were placed at the following prices per share: 15 at £15 10s., 129 at £15, 210 at £14 15s., and 146 at £14 10s.—the total amount realized being £7382.——At a public sale at Hayward's Heath on Tuesday 16 fully-paid £5 shares in the *Cuckfield Gas Company* produced £8 apiece; and 19 £10 fully paid-up shares in the *Hayward's Heath Gas Company* fetched £20 5s. and £20 10s. each.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Monday, April 16.

(*Before Justices* WRIGHT *and* BRUCE.)

The Yeadon Water-Works Company v. Binns and Another.

This matter came before the Court by way of a special case, stated by the Arbitrator, in reference to disputes arising out of a contract to construct a reservoir at Hawksworth. The contractor, Mr. John Brigg, failed to complete the contract for want of money; and one of his guarantors, Mr. Samuel Wright, with a view of diminishing his liability under the contract for penalties, entered into an agreement to finish the work. Upon the completion of the reservoir, disputes arose; Wright making a claim for extra work, and the Company claiming, under the contract with Brigg, penalties of £5 a day for non-completion within the specified time. The question for the determination of the Court was whether the Company could recover penalties for the delay in the completion of the contract, and deduct them from the money retained in their hands. On behalf of Mr. Wright, it was urged that, by the substitution of his name for that of Mr. Brigg for the purpose of completing the works, the Company were deprived of the right to recover any consequential damages arising from the original neglect of Brigg to carry out the terms of his contract.

Mr. TINDAL ATKINSON, Q.C., and Mr. CHITTY appeared for the Company; Mr. GULLY, Q.C., and Mr. MANISTY represented the defendants.

At the conclusion of the arguments, it was suggested by their Lordships that the special case should be withdrawn; that the arbitration should be proceeded with; and that at its conclusion the Arbitrator (Mr. Preston) should state his award in the form of a special case—being assisted in so doing by a legal gentleman—and that the matter should then come back to the Court. To this suggestion the parties acceded.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, May 1.

(*Before Mr. Justice* KEKEWICH.)

Halifax Corporation v. Morley Corporation.

This was an action to obtain an injunction to restrain the Morley Corporation from supplying water to the Great Northern Railway Company, or to any corporation, local board, or other authority, so as to interfere with the rights of the plaintiffs.

Sir H. JAMES, Q.C., M.P., Mr. C. M. WARMINGTON, Q.C., M.P., and Mr. VERNON SMITH appeared for the plaintiffs; Mr. H. H. COZENS-HARDY, Q.C., M.P., Mr. A. J. PARKER, and Sir G. MORRISON represented the defendants. Mr. P. B. ABRAHAM held a watching brief for the Great Northern Railway Company.

Sir H. JAMES, in opening the case, said he thought it could be reduced to a very small point, and would depend entirely on the construction of the Local Act.

Mr. COZENS-HARDY remarked that the Great Northern Railway Company were not made defendants.

Sir H. JAMES said he was only asking to restrain the defendants, the Morley Corporation, from exceeding their powers. It did not appear to him that the Great Northern Railway Company were necessary defendants. There were several Acts of Parliament which might possibly have some bearing upon the question; but he thought he might begin with the Halifax Water and Gas Extension Act, 1870, which gave power to the Halifax Corporation to obtain certain larger quantities of water, and, by section 11, to supply it to the estates of a Mr. Saville, situated in certain townships. One of these, which would become important, was the township of Soothill. It was alleged in the statement of claim that agreements were entered into between the plaintiffs, Mr. Saville, and the Local Board of Soothill, for the supply of water; and, under these agreements, it was obligatory on the plaintiff to furnish certain quantities, if required, at specified prices. Since the last agreement, and until the events occurred which formed the subject of the present proceedings, Halifax had continued to supply water under this agreement. The Local Board was empowered to supply, and did supply, with water, the Guardians of the Wakefield Union; this being the Rural Sanitary Authority for the district. By section 51 of the Public Health Act, 1875, power was given to sanitary authorities to take and receive water from other authorities outside their districts. By virtue of these powers, Soothill supplied the Wakefield Union; and the latter body supplied the townships of East and West Ardsley. In East Ardsley, the Great Northern Railway Company had very large works; so that the Halifax water without doubt reached East Ardsley, and the Great Northern Railway Company's water was supplied by the Corporation of Wakefield as well as by the Guardians of the Wakefield Union. But the greater proportion came from the Guardians, and therefore from Halifax. There was a further supply of water now going on from the Great Northern works to some other townships; but this was only a carrying on of the same water, so that the question of delivery to the Company's works at East Ardsley was really the subject in dispute. By an Act of 1890, the Morley Corporation were empowered to construct water-works; the limit of their supply being the borough. At that time, Halifax, having supplied the surrounding district, was rather afraid of an invasion of its trade with the outlying districts; and, in order to protect Halifax, section 11 was inserted in the Morley Act. It was upon the construction of this section that the question would mainly turn. It was as follows: "Notwithstanding anything in this Act contained, the Corporation [*i.e.*, the Morley Corporation] shall not, either directly or indirectly, supply any water, nor enter into any contract with any corporation, local board, or any local authority, company, or person, whereby any water may be directly or indirectly supplied to, or used within, the limits for the purpose of water supply by the Corporation of Halifax defined by the Halifax Water and Gas Extension Act of 1870, and by the Act referred to in the last schedule to the last-mentioned Act, nor within any township, district, or place within which water is, at the time of the passing of this Act, either directly or indirectly supplied by the Corporation of Halifax." The purpose evidently was not only that Halifax should be protected within its own area, but, wherever it had been directly or indirectly supplying water, that Morley was to be excluded from being a competitor. The words "directly or indirectly" were very important. He understood the contention on the other side would be that Halifax did not supply to East Ardsley or to the Great Northern Railway Company because it supplied to Soothill; and, having done this, it had nothing further to do with it. If the words had simply been "to any township," &c., "within which water was directly supplied by the Corporation of Halifax," the argument would have great force; but when the qualifying words "directly or indirectly" were added, it was evident that something further than direct supply was intended. As a matter of fact, the water from Halifax reached East Ardsley and the Great Northern Railway Company, although it did so indirectly, in consequence of Soothill supplying the Wakefield Union, and the Union supplying the Railway Company. Then he understood that another point—and it was a remarkably ingenious one—was this: Morley having entered into the agreement that they would not supply any water where Halifax had been supplying it, determined, if they could, to get round it; and, from the correspondence which had taken place, some remarkably ingenious and precautionary measures appeared to have been devised. The defendants determined to deliver water to the Great Northern Railway Company; but, from the correspondence between the Town Clerk and the Solicitors to the Railway Company, it was quite evident that they saw this question might be raised, and endeavoured to avoid it. Therefore they said, in effect, to the Company: "We will not carry the water to you in East Ardsley, which is out of our district; but you must come and fetch it. Bring your pipes into Morley, and there will be a meter provided; and we will supply the water to you for your works in East Ardsley, to be used there. Inasmuch, however, as you will have to carry it to your works, we do not supply it to you in East Ardsley, but in the borough of Morley." He did not think this ingenious device would be of much avail. There was a somewhat similar case with regard to the supply of gas in London. It came before his Lordship in the first instance, and afterwards went to the Court of Appeal and the House of Lords, where it was held that a gas company could not increase its area of supply in this indirect manner—that one company could not put a meter outside the district of another, and let the gas pass through it so as to supply that district.* In the present case, it was evident the parties were aware that the question might be raised, because there were several references in the correspondence to the question as to who should bear the cost of any litigation which might arise. He did not think there would be really any dispute as to the facts; and he would therefore take the evidence shortly.

Mr. *F. Massey*, examined by Mr. WARMINGTON, said since 1889 he had been Water-Works Manager to the Wakefield Union. In 1890 they obtained from the Halifax Corporation water for Wakefield, East and West Ardsley, Lofthouse-with-Carlton, Thorpe, and Soothill; they also procured a supplemental supply from the Wakefield Corporation. The Great Northern Railway Company had large works at East Ardsley, near Halifax. Water came in a pipe, and passed through a meter at a place called Babes-in-the-Wood. Witness described the route afterwards taken by the pipes. There was one direct from the meter-house to the Railway Company's works; and the village of East Ardsley was also supplied. This state of things continued till the close of the year 1893. The quantity of water supplied was approximately 110,000 gallons a day in 1890; rather less in 1891; and in the two succeeding years, about 100,000 gallons. Of this quantity about 80,000 gallons were used by the two Ardsleys. In addition to this, they obtained from the Wakefield Corporation from 50,000 to 70,000 gallons per day; so that the supply was approximately two-thirds from Halifax and one-third from Wakefield. Since December, 1893, the supply of Soothill water to East and West Ardsley had fallen off very considerably. Lofthouse-with-Carlton and the Great Northern Railway Company at East Ardsley had ceased to take the Soothill water, and had it from the Morley Corporation. The domestic supply of East and West Ardsley still came from Soothill. The townships of Lofthouse and Thorpe also obtained their water through the Great Northern Company's pipes conveying water from the Morley Corporation.

Mr. *Keighley Walton*, the Town Clerk of Halifax, was the next witness. He gave evidence as to the passing of the Morley Act, and the insertion therein of section 11, protecting the Halifax Corporation. Prior to 1893, he had heard nothing of the intention of the defendants to supply the Great Northern Railway Company at East Ardsley and the other townships named. Agreements were made in 1871 and 1887 between the plaintiffs and the Soothill Local Board for the supply of water; and they were in existence in 1893.

Cross-examined: He could not say where Soothill took the plaintiffs' water, unless it was at Clifton Bridge, in Brighouse. He believed this was the spot; and it was within the limits of the Halifax supply. The Halifax Corporation had litigation with Soothill about the water supply, and objected to the latter selling the water at a profit; but it was decided that Soothill could do what it pleased with it. He negotiated with the Town Clerk of Morley the insertion of section 11; but no plans or papers of any kind were used on that occasion. Mr. Gott was not present.

Sir H. JAMES objected to any evidence of negotiations being used to construe the section in question.

Justice KEKEWICH said he should not consider them.

Sir H. JAMES was about to refer to the correspondence to show the terms of the arrangement between the defendants and the Great Northern Railway Company, when

Mr. COZENS-HARDY said there was no dispute as to the facts. The

* The case referred to is that of *The Gaslight and Coke Company v. The South Metropolitan Gas Company*, in regard to the supply of gas by the latter Company for use at the Nine Elms Station of the South-Western Railway Company. The final proceedings were reported in the JOURNAL, Vol. LIV., pp. 256, 307.—ED. J.G.L.

Great Northern Railway Company had a station in Morley; and they there took the water from a meter, and conveyed it in a pipe along their own line to East Ardsley, where it was used for their works. There was no contract under seal yet; the terms not being finally arranged. It was also admitted that, in order to prevent a water famine in Thorpe and Lofthouse, the Railway Company had, with the consent of the defendants, allowed the Rothwell Local Board to temporarily connect their pipes with those of the Company.

Sir H. JAMES said of course the real question was the supply to the Railway Company at East Ardsley.

Mr. COZENS-HARDY said Halifax had certain statutory rights, and a monopoly within the district of supply. It had also certain rights under the general law; but under that law they could not supply a gallon of water to Soothill or to any part of that district, because, although this was under the general law, a water authority could not serve another district which was "adjoining." In 1870 they were applying for an Act of Parliament which greatly extended their area; and Mr. Saville, the owner of the Saville Estates, thought it was important for the development of his property that there should be certain rights given to him and certain obligations imposed upon the Halifax Corporation with reference to these townships, which did not adjoin Halifax, and which, but for the special powers in the Act, Halifax would have no right to supply. This was how section 11 of the Act of 1870 came to be introduced. There was a limit to a maximum and a minimum—the Soothill Board being bound to take the minimum; and the Corporation being bound to supply, if required, up to the maximum. Under this power, agreements had been entered into between the Halifax Corporation and the Soothill Local Board, who thereby became entitled to have, within specified limits, and were bound to take at a fixed price, a certain quantity of water from Halifax. The minimum, he believed, and certainly the maximum, was far more than Soothill required for its own purposes. The view Halifax took of the matter was that the price they were bound to charge was not remunerative; and they said that Soothill had no right to claim more water than was actually required for its own district. This matter came before the Courts in the case of *The Corporation of Halifax v. The Local Board of Soothill*.* It was a bill filed by the Corporation, who stated that the price charged was not remunerative; and they asked for an injunction to restrain the Local Board from selling water to any adjoining authority. This was met by a demurrer; and Vice-Chancellor Bacon allowed it—holding that there was nothing in the Act to restrict the Board from selling that which they were compelled to buy, and might not want. The case went to the Court of Appeal; and the judgment was upheld by Lords Justices James and Mellish. What was the state of things when the Act of 1890 was passed? The Halifax Corporation were supplying directly to every consumer within their own limits of supply. They were also serving indirectly Soothill and those other townships by supplying the Local Authorities with whom they had contracts; and the several authorities alone dealing with the consumers in those districts. They were the two subject-matters with which Halifax alone had to do. According to his instruction, the Engineers and the Town Clerk of Halifax, in discussing the clause which was to be inserted, produced a plan showing the district supplied by Halifax—that was Halifax proper and Soothill—and these other districts that were called part of the Saville Estate.

Justice KEKEWICH said the difficulty about this was that there was nothing in the Act which contained any reference to a plan. The important words were "within any town, district, or place within which water is at the time of the passing of this Act either directly or indirectly supplied by the Corporation of Halifax."

Mr. COZENS-HARDY said he relied upon the words "by the Corporation of Halifax;" it did not say "Halifax water."

Justice KEKEWICH said he was quite aware of that; but there was no reference here to any plan, but only to the fact of water being supplied. He did not see how any discussion between the gentlemen before the passing of the Act could be admissible.

Mr. COZENS-HARDY wished to invite his Lordship's attention somewhat critically to the language of the section; and desired him to be in possession of the parliamentary facts at the date of the action.

Justice KEKEWICH said certainly; but parliamentary facts, as he understood them, did not include conversations in the Lobby.

Mr. COZENS-HARDY admitted that this was so; but he said the section began with these words, which were the key to the whole: "The following provisions shall have and take effect for the protection of the rights, privileges, powers, and authorities of the Corporation of Halifax." Now, Halifax had no right, privilege, power, or authority in East Ardsley. It was not lawful for it to supply a gallon of water there, "either directly or indirectly." It would have been *ultra vires;* and the Attorney-General might have restrained them.

Sir H. JAMES said they had power to do it under section 50 of the Act of 1858, which said the Corporation might from time to time enter into, and carry into effect, contracts or arrangements with any persons for delivery of water, on such terms as might from time to time be agreed upon, beyond the limits of the Act for the supply of water.

Mr. COZENS-HARDY said this would not in the least have rendered it feasible or possible for Halifax to break up roads or lay pipes; so that practically they could not have supplied water in the district. They could only do so by virtue of the power given to, or rather by reason of the duty imposed upon, them by the Saville Act—the right and the obligation of supplying water, not to the consumer directly, but to the Local Board of Soothill, to be distributed by them for the purpose of their own customers, and, according to the decision of the Court, to be dealt with by them as water they had purchased, and could dispose of to anyone they pleased. The section was for the protection of the "rights, privileges, powers, and authorities" of the Corporation. After again reading the words of the section, the learned Counsel pointed out that it did not say any place within which Halifax was supplied, but any "township or place" within which water is supplied from the Halifax Water-Works. He submitted that the water was not, at the passing of the Act, either directly or indirectly supplied by the Halifax Corporation to East Ardsley. The words "directly or indirectly," did not occur to him as being of any great importance. His Lordship would probably construe the section just the same as if the word was "supplied." The water must be supplied by the Corporation to the township or district. Then there was no relation whatever between the Corporation of Halifax and the Wakefield Urban Sanitary Authority and the other bodies which had local powers in these districts. The water which was indirectly supplied was furnished to the Saville Estate; and the Soothill people made a profit by it. It was their water; and he submitted that it could not possibly be said that it was water indirectly supplied by the Corporation of Halifax. If an engine of the Great Northern Railway Company had its tank filled with water at Morley, it might go all over the kingdom. But this was not what the section aimed at. Some reasonable limit must be put upon it. He submitted that the plaintiff's contention was extravagantly unreasonable, because he could not see where it was to end. The words "directly or indirectly" were abundantly satisfied in the way he had pointed out—"directly" meaning to their own consumers, and "indirectly" meaning to the people who had the water from the various local authorities who obtained it from the Halifax Corporation. The facts with regard to the Great Northern Railway Company were these: It was no new thing for the Company to get their water from Morley, and carry it on their own land and through their own pipes to their works at East Ardsley. This had been done continuously from 1873 to 1883. It was quite true that the works were not then so large as they now were. They had been recently extended, and consequently more water was required. The Company were not satisfied with the water they could get from other sources; and they did that which, he submitted, they were entitled to do. They had works within the borough of Morley. There was a meter there; and water was supplied by the defendants, and was then taken in pipes which the Company had laid on their own land, where the pipes were. The present pipes were larger simply because of the extension of their works at East Ardsley. This was not at all like the case of the two Gas Companies which had been cited. There each Company had a monopoly within certain limits. Here there was no question of monopoly at all. If any other body except the Morley Corporation did this, the Halifax Corporation could have no possible right to complain. The House of Lords held that the parliamentary monopoly of gas companies could not be evaded by delivering gas at one place, and taking it to another to be consumed. This was a totally different case. Halifax had no right whatever in East Ardsley. It could not make a contract with any person there for the supply of water; and he submitted that this case was no better or worse than if the Railway Company had filled an engine with water at Morley, and taken it to East Ardsley. Before calling evidence, he wished to put in a few answers to interrogatories, in one of which the plaintiffs said: "The plaintiffs had never received a remunerative price, nor any price beyond that fixed by the 11th section." It was very strange, therefore, that the plaintiffs, for some reason he could not understand, came to ask for a right to supply water at a non-remunerative price; and the answer to the third interrogatory showed that the plaintiffs' supply had not fallen off, but had rather increased. These answers made the plaintiffs' case still more remarkable. It was not a case of the Court being asked by a trader who was making a profit to prevent interference with his business, but of a request by a trader to be assisted in securing an ever-increasing loss, as it was admitted that the water was not supplied at a remunerative rate. From any point of view, he submitted that this was not a case in which an injunction should be granted, and that relief could be given by damages; and, in the face of that answer, he did not see how a single farthing could be recovered.

Sir H. JAMES said, with regard to this last point, nothing of the sort had been put in cross-examination; and he understood it was a total mistake. But, on looking at the interrogatory, it would be seen how the misunderstanding arose. The interrogatory was: "Have the plaintiffs ever, and for what purposes, received for water there supplied a remunerative price, or any price fixed beyond the said 11th section?" The Town Clerk read these two phrases together, and merely intended to say that they had not received any price beyond that fixed by the section. If there was any doubt about it, he would ask the Town Clerk a further question.

Mr. *Walton* was then recalled, and said the price under the Act was 6d. per 1000 gallons. This was the charge to Soothill; and it was remunerative.

Cross-examined: He was not Town Clerk at the time of the litigation with the Soothill Local Board. He believed it was then alleged that the supply was not remunerative; but the allegation was not correct.

Re-examined: He was quite sure that 6d. per 1000 gallons paid the Corporation.

Mr. *C. Gott*, M.Inst.C.E., was then called for the defendants. He said he was acquainted with the water-works of the Corporations in the West Riding of Yorkshire; and he produced plans showing them. He was about to state what took place at the time of the passing of the Act; but his Lordship ruled that this was not admissible.

Mr. COZENS-HARDY said he presumed it would not be disputed that from 1873 to 1883 the Railway Company took water from Morley along their own lines to their works.

Justice KEKEWICH said he understood this was coupled with the statement that the supply was very much smaller. The only question could be whether the works as they now stood were substantially the same or substantially different from those which formerly existed.

Mr. COZENS-HARDY said, of course, he could not claim any prescriptive right. Any interference by injunction with the supply of water to these works, considering the large number of men engaged, would necessarily be a very serious matter.

Justice KEKEWICH said, according to the practice of the Court, there was always time allowed in such a case.

Sir *H. Oakley*, General Manager of the Railway Company, was then called. He said that from 1873 to 1883 there were works at East Ardsley which were supplied by water obtained at Morley, and led by pipes along the railway. He did not know that there was a Corporation then at Morley. The works were very small, having accommodation for only six engines; now there was room for 65. The number of men employed at present was between 300 and 400; and 100 cottages had recently been erected close to the railway for the men. It was

* See JOURNAL, Vol. XXIII., p. 810; and Vol. XXIV., p. 15.

absolutely necessary to have a good supply of water; and with this view, pipes were laid down from Morley to the new works. The water was taken in by a meter at the Morley boundary. The Railway Company paid the same price as any other large consumer in the borough—viz., 7½d. per 1000 gallons. They had no special favour. There was a draft agreement; but it was not yet settled, because, this question being raised, it was thought wiser not to commit themselves finally until the legal position was ascertained. At the present time they were taking 120,000 to 140,000 gallons of water a day. The water conveyed along the pipes had sometimes been used for the adjoining township of Rothwell. The Chairman of the Rothwell Local Board came to him some time ago, when the cottages were on the point of being occupied, and said they had practically no water for them. As a matter of fact, it was for a time supplied by carts; and they had received notice from Wakefield that their supply would terminate at the end of the year. He thereupon said he did not know what their legal position might be; but he felt sure he should not be wrong in letting the water-pipes at the boundary of their property be connected with pipes belonging to the township of Rothwell, and that they must settle with Morley what they would have to pay for the water—the Railway Company simply charging a small royalty for the use of the pipes. Before they had the water from Morley, the supply was very inadequate at East Ardsley, and put them to great inconvenience. On many occasions, they were without water, and sent engines from Ardsley to other points to get some before they could do their work.

Cross-examined: The Company's business at Ardsley had been increasing gradually; and it was to provide for this and what they saw was coming that the works had been very much enlarged within the last two years. Twelve months ago the new works were not ready; and water was then obtained from the Wakefield Sanitary Authority—probably to the extent of from 50,000 to 60,000 gallons a day.

In reply to his LORDSHIP, witness said they began to take the Morley water at the latter end of December, 1893.

Sir G. MORRISON then briefly addressed his Lordship on the construction of section 11 of the Act of 1890. He submitted that the Soothill case which had been referred to was practically conclusive. There it was argued that it was an improper thing for the purchasers, the Soothill Local Board, to sell the water; and Vice-Chancellor Bacon held that the Board were in a position to sell it, and could sell it in defiance of Halifax. If the water were sold in defiance of Halifax, it could not be an indirect supply by the Halifax Corporation.

Justice KEKEWICH said the difficulty was, if that was not a direct supply, what was?

Sir G. MORRISON submitted, with respect, that it was not necessary for him to show that; but he should say that the direct supply was the supply within the limits, and that the indirect supply was the supply to the township of Soothill.

Justice KEKEWICH, without calling upon Sir H. James to reply, then delivered judgment. He said there was no dispute as to the facts; and the whole case turned on the 11th section of the Act of 1890, and on a critical examination of that section. Without saying that there was no room for criticism and argument, when looked upon as a whole by the light of the admitted facts, the construction was, he thought, reasonably clear. The preamble of the section was the part which might produce the difficulty. As had been pointed out by Sir George Morrison, it said; "The following provisions shall have and take effect for the protection of the rights, privileges, powers, and authorities of the Corporation of Halifax." One would expect to find some provisions of a protective character with reference to the Corporation, but strictly limited to their "rights, privileges, powers, and authorities;" and one would not expect provisions protective of their *de facto* occupation of any district, or their *de facto* supply of water, but merely to that which, being matter of fact, was also right as matter of law. Why the rest of the clause was not strictly relative to the preamble, it was not for him to guess; but his conclusion was that it was not, and that the protective provisions did, in words beyond dispute, go outside any legal "rights, powers, privileges, and authorities." It might very well be that Parliament considered it wise and right, notwithstanding that the Corporation of Halifax had transcended their legal power, to say: "Here you are, and you shall not be interfered with—at any rate, not by the Morley Corporation; as between you and that Corporation, what you have done shall be deemed to be right." Or Parliament might have considered that what had been done by the Halifax Corporation up to that time might have referred to some legal origin, and was to be protected. The preamble having been in that form, the section went on in this way: "Notwithstanding anything in this Act contained, the Corporation shall not, either directly or indirectly, supply any water." The words "directly or indirectly" were obviously introduced with a meaning; and not only was the ordinary rule of construction binding upon him, that no words must be expunged without very urgent cause, and that one must give some reasonable meaning to every word employed. But beyond that general rule, there was this phrase "directly or indirectly" occurring three times, and not only with reference to the Corporation of Morley, but also with reference to the Corporation of Halifax. So that the phrases were intended to be co-relative. There must have been in the mind of Parliament some distinction between direct and indirect supply. He had challenged the defendants to produce any indirect supply, except that which had been proved in evidence by means of a supply to a body which, to coin a word, "sub-supplied" the township of East Ardsley. Then it was said that this question was litigated, and that Vice-Chancellor Bacon and the Court of Appeal held that the original suppliers could not be interfered with, and, having got possession of the water, might sell it again on any terms, and to any persons they might think fit, without control by the Corporation who furnished the first supply. This might be so; but that was a question of the control of the original supply, and had nothing whatever to do with the point whether they could not nevertheless be properly considered as indirectly supplying the persons depending on the sub-supplier. Taking the words "directly or indirectly" in exactly the same sense throughout the clause, he found no difficulty in construing it in the same manner in each case. The Corporation were not "directly or indirectly" to supply any water, nor enter into any contract whereby any water might be, either "directly or indirectly," supplied or used. That was an important distinction. The argument on behalf of the defendants had rested on the word "supply," and ignored the alternative words "or used," which could not have been put in there simply as an equivalent to "supply," but must have been intended to mean something different. At the date of this action, there was no doubt that water was supplied indirectly by the Corporation of Halifax to the township of East Ardsley. It was now proposed by the Corporation of Morley to take the place of the Corporation of Halifax, so that Halifax would no longer supply East Ardsley, which would be supplied from another source. But the defendants said they were not supplying those works at East Ardsley. The only place where the water was supplied was strictly within the Morley district; and there was no contravention of this provision by supplying the water there, notwithstanding that it seemed good to the Great Northern Railway Company to convey their water on their own lands, and to use it elsewhere at East Ardsley. The answer to this was that the Legislature had carefully provided against such a contingency. The Morley Corporation were not only prevented from supplying water inside the limits within which it was supplied by Halifax, but from supplying it so that it might be used within those limits; and the avowed intention was that the water should be sold to the Great Northern Railway Company in Morley, so that it might be used in East Ardsley, which brought their act precisely within the terms of the provision. Mr. Cozens-Hardy said an engine might be supplied in Morley, and might run anywhere, either to Halifax or to London; and, according to the plaintiffs' construction, this would be a breach of the provision. That would reduce the argument to an absurdity if it were sound; but he had not to deal with that particular case. That would be a supply in Morley, not a supply elsewhere; and he did not think there would be any difficulty in holding that the user of water supplied to an engine was, when it was put into the boiler, with the view of making the steam for the propulsion of the engine, and that the user was not for the purpose of the engine running over the line. However, this was a mere illustration. His view was perfectly clear, when once they got over the preamble, that what the Corporation of Morley were doing was supplying water, and that it was "supplied or used" within the township or place within which water was, at the time of the passing of the Act of 1890, "directly or indirectly" supplied by the Corporation of Halifax. A contravention of an Act of Parliament of this kind—which was really nothing more than a contract between the two Corporations, sealed with parliamentary sanction—must be met by injunction; and the injunction must be in the words of the Act. Of course, there were many conditions which ought to weigh with him in issuing an injunction of this kind. The parties might desire to appeal even to the House of Lords, or perhaps to Parliament itself; and therefore there would be some stay on reasonable terms being made. Some consideration also must be given to the inconvenience which might be cause to the Railway Company.

Sir H. JAMES said the Wakefield Union were in the position now that they were last year; and they could, within 24 hours, supply the Great Northern Company's works and all the cottages.

Mr. COZENS-HARDY said this was rather inconsistent with the evidence of Sir Henry Oakley. He was instructed to ask for a suspension of the injunction for six months.

Justice KEKEWICH remarked that this was too long.

Sir H. JAMES said, if the defendants would keep an account of the moneys received from the Railway Company, he thought the matter could be arranged.

Mr. COZENS-HARDY said he was instructed, although it was not in evidence, that the water which went from Morley to East Ardsley was really Halifax water. They were taking it from Halifax at present, because their own works were not quite completed. Of course, they would not have to pay for it twice over.

It was ultimately decided that the defendants should keep an account, and that the injunction should not issue until the last Friday in July; the defendants to pay the costs of the action.

Electric Lighting at Derby.—The Local Government Board have sanctioned the borrowing of £5000 for electric lighting extensions at Derby. The Town Council have decided to hold an electric lighting exhibition, commencing on the 14th inst.

Baildon New Water-Works.—At the meeting of the Baildon Local Board last Tuesday, the Engineer (Mr. B. Walker) reported that the works in connection with the construction of the new water reservoir were practically completed. The gathering-ground is 379 acres in extent. The area of the reservoir at the top is about 8 acres; and it has a capacity of more than 30 million gallons—the embankment admitting of easy extension, so as to increase the capacity by upwards of 15 million gallons. The works and the purchase of the land have entailed an outlay of about £30,000. The cost has been much greater than was anticipated; the original estimate having been £16,000.

Manchester Corporation Water-Works.—At the meeting of the Manchester City Council last Wednesday, Sir John Harwood, in moving the adoption of the report of the Water Committee, stated that the revenue in the past year had been increased by £5036. Before the Thirlmere works came under their care, they spent more money on maintenance and repairs of the Woodhead works than was necessary at the time, knowing this heavy charge was coming upon them. The amount expended this year on those works was £5417 less than in the previous year. A sum of £84,000 was required for interest on the Thirlmere works; but by reason of the arrangement made some time ago as to a sinking fund, and the practice of other economies, they had only £33,000 to raise for that purpose. They were entitled to take out of the funds applicable to construction, the interest on the capital expended. But it was not necessary to do this, as they had £57,000 in hand, and would only require to take £33,000; and, if they went on as they were doing, they would overtake the interest in regard to the Thirlmere works without charging a penny to the rates or raising the price of water. This was the most gratifying report he had had the opportunity of placing before the Council. In reply to a question, Sir John stated that the citizens might expect a delivery of water from Thirlmere during the present year. The report was adopted.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly General Meeting of this Association was held last Tuesday, at the Cannon Street Hotel—Sir JULIAN GOLDSMID, Bart., M.P., in the chair.

The SECRETARY (Mr. R. S. Gardiner) read the notice calling the meeting, and subsequently the following report of the Directors:—

The present half-yearly ordinary general meeting of the proprietors has been convened, in conformity with the Association's Acts of Parliament, for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended the 31st of December last,

The following summary shows the results of the Association's operations during that period: The quantity of gas made in the half year ended the 31st of December last was 4392 million cubic feet; the quantity made in the corresponding half year of 1892 was 4356 million cubic feet—being an increase of 36 millions, or at the rate of 0·82 per cent. The total number of lights on the 30th of December last amounted to 2,135,253; there being at that date 150,791 consumers on the books of the Association. At the close of the corresponding half year of 1892, the number of lights was 2,054,553, which gives an increase of 80,700, or at the rate of 3·92 per cent. The entire length of mains on the 31st of December last was 1722 miles; the length of mains laid on Dec. 31, 1892, was 1667 miles—an increase of 55 miles.

The business of the Association during the past half year has continued to suffer from the general depression of trade on the Continent, and also from the practice of greater economy in the consumption of gas on the part of the consumers—due chiefly to the use of improved burners. Notwithstanding a satisfactory increase in the total number of consumers, the aggregate quantity of gas sold remained about the same; and the gas-rental was unfavourably affected by the increasing proportion of gas used for cooking and heating purposes, which the Association sells at a lower price.

The profit of the past half year was about the same as that of the corresponding half year.

There was a decrease in the cost of coal; but it was accompanied by a corresponding reduction in the receipts for coke and tar. There was an increase in the value of ammoniacal liquor.

The plant and mains at all the stations were maintained in a due state of efficiency.

The Directors have sold land for which there was no further use at Aix-la-Chapelle, Ghent, and Marseilles.

The Directors beg to report that they have secured a concession for the supply of gas to Lankwitz—a suburban commune of Berlin—and that they have obtained a prolongation of their concession at Neu Weissensee—another suburb of Berlin—until the year 1938.

The Directors have the satisfaction to announce that the whole amount of the reserve fund, of which they were authorized by the proprietors in 1883 to make temporary use for the purpose of the new capital required at Amsterdam, has now been entirely reinstated and reinvested in Consols.

They have further to announce that, with a view to meet as far as possible any loss of capital that might occur in future on the expiration of concessions, they have decided to appropriate to the depreciation fund various deposits and other investments on the Continent; and these will be added to, from time to time, by such amounts as the Directors may consider necessary.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 31st of December last. These have been duly audited, and from them the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme, showing the profit of the Association for the half year, and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended the 31st of December last, and a bonus of 1 per cent., both payable free of income-tax on and after the 1st day of June next.

The Directors who go out of office by rotation are Sir James Carmichael, Bart., M.P., Thomas Henry Goodwin Newton, Esq., and Colonel Josiah Wilkinson. These gentlemen are eligible for re-election, and offer themselves accordingly. The Auditor who goes out of office by rotation is Montagu Somes Pilcher, Esq., who is eligible for re-election, and offers himself accordingly.

The CHAIRMAN, in moving the adoption of the report and accounts, reminded the proprietors that at their last meeting he pointed out the great difficulties which all gas companies had experienced in the past, owing to the strikes which arose among the mining population in this and other countries; and he also intimated that, if their expenditure were increased, they would certainly not feel that they were justified, if they had not thoroughly earned it, in paying the same dividend. Fortunately their anticipations in this respect had not been realized. Very great economy had been exercised in all directions; and, as far as they could, they had made every source of profit available to the Association. But the words of warning which he used at their last meeting, he desired to repeat on the present occasion, because he wanted them thoroughly to understand that these difficulties might occur, and they were beyond the control of any Board of Directors. As a matter of fact, in all the past experience of every gas company, when the price of coal fell the price of coke fell also, and sometimes even more rapidly than the former came into play. This, of course, affected the profit of gas companies very considerably. But, under all the circumstances of the case, he must say that, in his opinion and in the opinion of the Board, the working of the Association had been eminently satisfactory; and he thought the shareholders had reason to be thankful to their able staff at all their different stations. That anything special had occurred in the half year, apart from what he might call these internal and difficult matters, it was not his duty to tell them that day. It had been a very ordinary half year; and there having been no special business event, he did not know that it was necessary for him to detain them. He had, however, heretofore informed them at their half-yearly meetings of anything fresh which had occurred since the close of the six months, in order that the shareholders might be kept up to date in the proceedings of the Association; and they had had one very interesting incident since the 1st of January—viz., the great strike of the men employed at their Vienna works, the most important station of all. The numbers employed varied according to the time of the year, because, of course, the consumption in the winter being very much greater than the consumption in the summer, the number of men engaged in winter for producing the gas must correspond. It was about the middle period—half way between the top and the bottom of the tree, as it were; and a large number of their men (between 1300 and 1400 out of 1700 or 1800), for no good cause, took it into their heads to decline to do their work, and walked out of the establishment. He said "for no good cause," because their men were paid more than any other men in any occupation of a similar kind in Austria. The Association had treated their men with every liberality. They had a system of pensions, to meet the circumstances of old age and inability to work—a system which affected a considerable number of men, and which was of great value to them. Still, between 1300 and 1400 walked out of the works, as he had said. Their Engineer, however, had made such good arrangements, that, in the course of three days, all the places of these men were supplied; and there was no interruption in the regular and proper distribution of gas in the town. This showed more than any words of his could what a very capable staff they had at this most important station, and how well both the town of Vienna and the shareholders had been served. It also indicated that, where they had right upon their side (as the Association certainly had), they could without fear meet unreasonable demands of the men, and, he believed in this case, with universal public approval in that important capital. He would not trouble them with all the details of the case. His colleague Sir James Carmichael and himself went to Vienna only the other day, at very considerable personal inconvenience, and thoroughly investigated all matters connected with the strike, and made all the arrangements which were necessary in consequence of it at a period when it was practically brought to a close. There was, however, this advantage in such a visit on their part—that it encouraged and supported their staff in the arduous work they had to do; and, of course, it brought to bear upon any questions which arose in consequence of the strike the varied judgment of the men who were occupied in carrying on the business of the Association. He would only add that, with the advice and assistance of those who remained faithful to them, they were re-engaging such of the men as deserved to be taken back; and, as far as possible, they would take care to exercise even-handed justice among them. He told the proprietors at their last meeting that they had then recently acquired the town of Corbeil, in France. They were now putting the works there in proper order, and improving the supply of gas; and they believed that they would get a fair return on the capital invested in that part of their undertaking. He concluded by moving the adoption of the report.

Mr. BASSETT seconded the motion.

Mr. HORNCASTLE expressed his gratification at seeing the reserve fund reinstated, as mentioned in the report, and reinvested in Consols. He desired, however, to know the exact purposes of the reserve fund, as there were several other accounts (which he specified) which might be called reserves. He more especially desired to know whether the reserve fund could be appropriated to equalize their dividends in case of any accidental or temporary falling off in them.

Mr. F. J. TAYLOR inquired when the negotiations regarding the Vienna concession would be concluded.

The CHAIRMAN, in reply, observed that they stated in their report that the reserve fund, which was used temporarily for the purpose of capital expenditure at Amsterdam, had been replaced. The money was employed in this manner with the consent of the shareholders. He believed it had always been their practice—certainly it had been their practice during the 26 years he had been connected with the Association—for all repairs and renewals of every kind to come out of the income; and this outlay must appear in some form or other. The money had been spent in improving the works, however; and there was no asset for it separate from the works. The reserve fund was therefore established, because it was felt by the Association, as by the Directors also, that it was eminently desirable that there should be a considerable sum of money available in reserve. The fund was not created with the object of equalizing dividends in their case, but in order to have the command of capital in the event of necessity. It was a wise provision to have formed the reserve fund. As regarded what was called the depreciation account, they had established the plan of putting by a certain amount for depreciation every year; but they had assigned no securities, as it were, to represent it. They had investments in certain gas and other companies; but they had now, under the arrangement they had made, assigned property to represent the amount of depreciation. This he thought was a right course; and it was on the side of careful management. With reference to the negotiations at Vienna, he regretted to state that his experience of negotiations was very long, both at Vienna and elsewhere; and he had invariably found that what appeared to him to be a reasonable time for the conclusion of arrangements, did not at all correspond with the views of others with whom he had to deal in these matters. He might mention that, in connection with a town in another part of the world, they had been trying for three years to come to an arrangement on a small subject. They had been repeatedly told by their legal advisers that there was every prospect of the matter being settled within a week. It was not settled yet; and he could not tell them when it would be. This was just an instance of how a thing might drag along when they had to negotiate with a very large body of persons varying and changing, and consequently entertaining different opinions at different periods of the year. They were at present in very friendly relations with the town of Vienna. The authorities there had been talking of various plans of settling with the Association—buying them up, building new works, and doing a hundred other things. The Directors from time to time had dealt, to the best of their ability, with the circumstances that arose; but no conclusion had yet been arrived at. All he could say was that everything that arose had the most careful and constant attention of the Directors; and they would do all they could to attend to the interests both of the shareholders and of the town.

The motion was unanimously adopted.

The CHAIRMAN then proposed the payment of a dividend of 5 per cent. for the half year ending Dec. 31 last, and a bonus of 1 per cent., on the £3,800,000 stock, free of income-tax.

Mr. BASSETT seconded the motion, which was unanimously carried.

The retiring Directors and Auditor having been re-elected,

On the motion of the CHAIRMAN, seconded by Mr. LUCAS, a hearty vote of thanks was passed to the staff.

An Extraordinary General Meeting was subsequently held.

The CHAIRMAN proposed the following resolution: "That the Board of Directors be and are hereby authorized, in accordance with the provisions of the Imperial Continental Gas Association's Act of 1893, to borrow sums not exceeding £500,000 by the issue of debenture stock, upon such terms, [in such manner, and at such times as they shall think fit, for the purpose of paying off the existing issue of debenture bonds as and when the same shall mature or otherwise." He thought that the resolution explained itself to a very great extent. At present they had altogether an amount of £500,000 of debentures outstanding, repayable at various dates, and upon these they gave an interest of 4 per cent. Upon the £350,000 debenture stock issued last year, they only paid 3½ per cent.; and therefore, instead of renewing their debentures at 4 per cent., it was obviously cheaper to add to the amount of the debenture stock at 3½ per cent. What the Directors proposed by the resolution was that they should be empowered by the shareholders to issue the remainder of the amount which they were authorized by the Act of Parliament to issue in debenture stock to replace the debentures as they became due, or sooner if any holder cared to come in and convert; so that instead of paying 4 per cent. they might pay only 3½ per cent.

Mr. BASSETT seconded the motion.

The CHAIRMAN, in answer to questions, stated that their indebtedness would remain the same after the debenture stock had replaced the debentures; but the interest paid would be less. In a couple of months £120,000 of the debentures would become due; and the Directors desired to be in a position to meet them. As far as they knew, most of the holders of the bonds would be glad to get the debenture stock, because it was a curious fact that the debenture stock stood higher in the market than the debentures, although the interest was smaller. The total powers of their indebtedness under their Act of Parliament were £950,000. Their present indebtedness was £850,000, divided into the two sums he had mentioned—£350,000 of 3½ per cent. debenture stock, and £500,000 of 4 per cent. debenture bonds. The debentures were issued repayable at a fixed date.

The resolution was unanimously agreed to.

A vote of thanks to the Chairman and Directors was afterwards passed; and the proceedings then terminated.

BOMBAY GAS COMPANY, LIMITED.

The Ordinary Meeting of this Company was held last Thursday, at the London Offices, 6, Drapers' Gardens, Throgmorton Avenue, E.C.—Mr. R. DAVIDSON in the chair.

The SECRETARY (Mr. J. H. Perrins) read the notice convening the meeting; and the Directors' report and the statement of accounts for the year ending Dec. 31 last (see *ante*, p. 770) were then presented.

The CHAIRMAN said he thought that, on the whole, the accounts were of a favourable character. They showed a marked improvement over the previous year, and enabled the Directors to pay a dividend of 3½ per cent. for the past six months, against 3 per cent. in the corresponding period of last year, besides carrying forward a considerable sum. If they referred to the credit side of the revenue account, it would be seen that there were considerable increases; and on the debit side a substantial reduction in the working expenses. The coal carbonized had cost £601 less, arising from cheaper coal and freights; and the prospects for the current year regarding coal and freights, he was glad to say, were also favourable, so that they hoped to renew their contracts at low rates. The item of purifying materials had been reduced by £208; and the trade charges were less by £702. Bad debts were only £19, which was very small, looking at the large amount of money collected—Rs. 5,34,341, which came home at an average of 1s. 2 3/32d. The loss on this was £20,107, which had been charged entirely to revenue. The weak point in the Company's future unquestionably was this matter of exchange. The cables from Bombay the previous day only quoted 1s. 1⅛d. per rupee; and since the last meeting of the shareholders, the Indian mints had been closed. The result had been a considerable fall in silver; and it had only had a moderate effect in hardening the rate of exchange. As he had said, the exchange now was 1s. 1½d.; whereas, if the mints were open and working on the old lines, the rupee could be laid down, with the present price of silver, at 1id. On the credit side of the account, the gas and meter rental was less by £293, owing to the adoption to a considerable extent of Welsbach burners, which consumed less gas. The Directors hoped that the favour with which these burners were regarded in Bombay would extend, and would ultimately lead to an increase in the number of their consumers. The residual products showed an advance of about £1300; and there was an additional £90 interest on deposits. The profit was £16,893, or £1578 more, notwithstanding the greater loss on exchange; and this result he thought the shareholders would all agree was very satisfactory. As stated in the report, the Municipality had renewed the contract for public lighting for another year from July next; and in the meantime they proposed continuing the experiments with the Welsbach burner, as applied to outdoor lighting. A number of trials were made last year especially to test its suitability during the monsoon; but there were difficulties connected with the burner yet to be overcome, which the agents for the patentee felt confident they could surmount. If this were so, the Municipality, who seemed most desirous of adopting this new light, would no doubt, as intimated, grant a contract for a term of years. The shareholders would be glad to hear that during the serious riots of last summer in Bombay, the Company were able to maintain the lighting of the city without a break. The staff behaved admirably on that occasion; and their Manager specially referred to the valuable services of Mr. Herbert Jones, the late Assistant-Manager (who had since left the service of the Company to take the management of the Margate Gas-Works), and also to Mr. Pennington, a very excellent officer of the Company. The Directors had engaged a new Assistant-Manager—a young man of promise and ability, who thoroughly understood every detail of his profession, and who was formerly in the service of the British Gaslight Company, and came to them with the highest credentials. The Directors proposed paying a dividend of 3½ per cent., as against 3 per cent. for the corresponding period of last year, carrying forward the substantial balance of £1404, which they thought necessary in view of the present condition of exchange. The Chairman concluded by moving the adoption of the report and statement of accounts, and the declaration of a dividend of 3½ per cent. for the past half year; making, with the interim payment, 6½ per cent. for the year, free of income-tax.

Major W. F. GORDON seconded the motion, which was unanimously adopted.

On the proposition of Mr. C. GANDON, seconded by Mr. SUART, Mr. Davidson was re-elected to his seat at the Board, as was also Mr. Gandon, on the motion of Mr. FREDERIC LANE LINGING, seconded by Mr. E. A. FLINDERS.

Mr. R. B. FITZMAURICE moved, and Mr. ADAMS seconded, the re-appointment of the Auditors (Messrs. Flinders and Magnus Ohren); and this was agreed to.

Mr. SUART, in moving a vote of thanks to the Directors, remarked that the shareholders could see from the accounts that the Board had effected various economies; but, if it had not been for cheap coal, the exchange would have swamped the Company. In his opinion, silver was at the present time the burning question of commerce and finance. A meeting was being held that day at the Mansion House, at which the matter was being discussed; but whether any beneficial result would ensue, he could not say. Another subject, which it would be remembered he ventured to mention at the previous meeting, was that of using oil for gas making. In the case of a company like theirs, where coal had to be carried a long distance, and consequently suffered considerable deterioration, he thought they would find it an advantage to employ oil. He believed that oil could now be landed at Bombay at less cost than formerly.

Mr. ADAMS seconded the motion.

The CHAIRMAN, in acknowledging the vote, assured Mr. Suart that the subject of making gas from oil would continue to receive the attention of the expert members of the Board.

Mr. GANDON said he might add a few words to this question. It was one that had occupied his attention for many years—not only with reference to Bombay, but to other places. So far he had not been able to convince himself that oil could be used advantageously as a substitute for coal; but as an enricher, it had a great future before it. Although it had been so greatly reduced in price of late years, it had not touched the figure at which it could be used to compete with coal. With oil they did not get residual products such as were obtained from coal, and which were so much valued. He could remember an instance where, in England, the residuals actually more than paid for the cost of the coal. He did not wish the shareholders to understand that this was the case at Bombay; but although the cost of coal out there was rather heavy, still the residuals yielded a very good return, and reduced the price of the coal to a moderate figure—to not so very much more than it cost in England. However, it was well they should keep their eyes on the look out; and if any means could be devised to economically substitute oil for coal, he should be the first to wish to see it done.

The CHAIRMAN next proposed, and Mr. T. S. BORRADAILE seconded, a vote of thanks to the Engineer and Manager at Bombay (Mr. Louis Penny), the Secretary, and the other officers of the Company.

The proposition was agreed to; and the proceedings then concluded.

SINGAPORE GAS COMPANY, LIMITED.

The Annual Ordinary General Meeting of this Company was held last Thursday, at Cannon Street Hotel, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. R. M. Christie) read the notice convening the meeting, and the Directors' report and accounts, of which a summary appeared in last week's issue, were taken as read.

The CHAIRMAN said that, in coming before the shareholders that day, the Board regretted exceedingly that they had not a better condition of things to put before them. At the outset, it was only fair to say the fault did not lie with them, or their Manager, as, on the whole, the business of the Company was fairly satisfactory, as compared with previous half years; and if it were not for the great and troublesome result arising from loss on exchange, which amounted to 7½ per cent., the Directors could have paid a very handsome dividend. As it was, the working had only resulted in a profit of about £500, which had been absorbed in writing down the stock values; leaving about the same sum as last half year to carry forward, and which the Board recommended should be retained for the purposes of the business. At the last meeting, reference was made to an extension of the public lighting contract, and the price at which it was proposed to renew it for a further period of two years. When they commenced the arrangement for the new term, the dollar value was 2s. 9d. But it had since fallen to 2s.; and when the contract arrived with the request that the Board should sign and seal it, they felt, in the interests of the shareholders, they were not justified in carrying it out, as it meant at the then price a loss of about £100 per month. They therefore cabled to the Manager to the effect that they could not complete the contract, and must ask for amended terms. In reply to this, they received a cable, saying the Municipality declined; and they were expecting by the next mail the further views of the Municipality on the subject. In putting the position before the shareholders, the Directors wished to have their support in the action they had taken; and they hoped to receive what might be considered a fair and reasonable price for the gas supplied. Their opinion was that the Municipality could not wish the Company to supply them with gas at a loss; and they were hopeful that they would sanction a price per lamp that would give them not less than 3 to 4 per cent. on the capital. They were desirous of obtaining this sum by having a price arranged on a gold basis, taking the dollar at 2s. 9d.—the same amount as the dollar stood at when they entered into negotiations last May. This at $2·60 per lamp per month, would give the Company 7s. 2d. sterling, or 86s. per lamp per

year—a sum according to the Directors' calculation that would leave the very moderate profit already mentioned. This, the shareholders would readily understand, was a very low price, and compared favourably with most of the public lighting in this country—in fact, it was less than London paid per lamp; while it was not half the price charged by some of the nearest towns and cities to Singapore, nor the price charged in South American towns. The fall in the exchange causing the receipts for private lighting to be so poor, the Board came unanimously to the conclusion that the only course for them was to increase the price; and, as mentioned in the report, they cabled to their Manager to advance it from May 1 from $3 to $4, with the same discount as before. Unfortunately, their Manager did not act upon the cable; and by the last mail, which reached London the previous Monday, he wrote asking the Board to reconsider the question. This might cause the loss of a month in raising the price. But it gave the Board the opportunity of taking the opinion of the shareholders; and they would be pleased to act upon the decision arrived at by them. As the first duty of the Directors was the making of a profit to give the shareholders a reasonable dividend, they hoped to have their support in increasing the price so as to give a moderate return; the additional price only to continue for the period that the exchange ruled so low. He might here mention that Mr. Magnus Ohren, one of their Auditors, who was not well enough to be present, had written to say he cordially agreed with what the Board had done. In turning to the balance-sheet, the Chairman remarked that the figures were pretty much the same as in the corresponding half of 1892, excepting the return from coke; and this showed a considerable falling off—arising from having to use Japanese coal (which did not yield so much coke per ton as English coal), in consequence of the strike in the coal trade in this country last year, and the high price charged. The gas returns were better; and the leakage for the past half year was only 2¾ per cent. The repairs to works were somewhat more; but this arose from a much needed restoration of the river wall. In conclusion, he proposed the adoption of the report and accounts.

Mr. B. Green seconded the motion.

Mr. T. A. Greene asked whether the Directors thought that the increased price which they were going to charge for gas would enable them to pay a dividend, because he was of opinion that it would not. He believed that the continued appreciation of gold would swallow up all their profits.

The Chairman remarked that, with the dollar on a 2s. 9d. basis (which they were asking the Municipality to give), the Directors believed there would be a return. That would be on a gold basis. Then it had been proposed to raise the price to the private consumers from $3 to $4; and, of course, if the dollar went lower, they would have to ask for more. At the present rate of exchange, these figures would give them a return.

Mr. R. G. Rice cordially supported the action of the Directors regarding the price; and remarked that, if they lost some of their customers by taking this step, they could not be worse off than now.

Mr. Dyer pointed out that, with the dollar at its present value, the price of gas worked out to something like 8s. per 1000 cubic feet. He noticed that the San Paulo Gas Company were charging 11s. 6d.; so that he did not think the gas consumers at Singapore could grumble. He also expressed his hearty approval of the policy of the Directors in writing down their stocks.

Mr. Robbins regretted that the Company had gone on so long without raising the price; and he inquired if the Board had well considered whether the proposed advance was sufficient to give some small return. He strongly advocated a firm policy on the part of the Directors; and further asked whether he understood correctly that the Company would lose £100 a month on the public lighting if the contract were renewed as originally proposed.

The Chairman replied that they were actually losing that at the present time; and, replying to Mr. Simmelkjör, he stated that there was no limit as to the price they could charge the private consumers.

Mr. Jameson hoped the Directors would be definite and firm in carrying out the wishes of the meeting; and with reference to the statement that they were losing £100 a month on the public lighting, he thought that was a rather reckless method of working.

Mr. Crisp suggested, as a means of overcoming the burden of exchange, that the Company should purchase goods at Singapore with the money they earned, and ship them to England.

The Chairman said he wished to explain in reference to the loss on the public lighting that they were working under the old contract, which expired on May 24; and for the last seven or eight days, at the existing rate of exchange, they had been working at the loss mentioned. If they could obtain a contract on the 2s. 9d. basis, it would give the Company 3 or 4 per cent. dividend from the Municipality, who were their largest consumers, and were about equal to the private custom. Therefore, it was necessary they should be supplied as cheaply as possible. He hoped the Company would never go into trading in the manner proposed by Mr. Crisp.

Mr. W. T. Batten remarked that it was very satisfactory to find the shareholders were so unanimous in approving of the steps the Directors proposed taking. So far as the municipal contract was concerned, the Company were undoubtedly getting a very low price—in fact, they were obtaining less for the gas per lamp than was paid in London; while they had the additional expense of sending the coal out to Singapore. Now the question they wished the shareholders to decide was: Were the Directors to adhere to the terms they wired out to the Municipality on the understanding that the dollar should be taken as worth 2s. 9d. [Mr. Batten asked the shareholders to formally vote on this question. This they did; unanimously replying to it in the affirmative.] Proceeding to refer to the private lighting, Mr. Batten stated that until quite recently he had been strongly opposed to the raising of the price of gas; and it was not until the dollar dropped to under 2s. that he gave in. He urged the shareholders, however, to only increase the price to the private consumers to a small extent. Personally, he would not advise an increase above $3½.

The motion was carried.

The Secretary, at the request of the Chairman, read the letter which the Board had received from the Manager regarding the proposed increase in price to $4. Mr. Smith stated that as it was necessary to give one month's notice to the consumers of any alteration in price, before taking the proposed step, he had considered it the safer plan to hold action until June 1; thereby enabling the Board to telegraph again after they had further discussed the question.

Mr. Greene, in order to remove from the Directors the responsibility of raising the price, proposed that it should be increased to $3½.

Mr. Sampson seconded the motion, which was agreed to.

Resolutions were also passed, re-electing the retiring Director (Mr. F. A. M. Nicol) and the Auditors (Messrs. Ohren and Guyatt); and the services of the Chairman and Directors and the officers were duly acknowledged.

WEST MIDDLESEX WATER-WORKS COMPANY.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Offices, Marylebone Road, N.W.—Sir W. H. Wyatt in the chair.

The Secretary (Mr. F. H. Wybroo) read the notice calling the meeting; and the report of the Directors and the statement of accounts were taken as read. He afterwards read the report of the Auditors, who stated that the investments of the reserve fund were as reported last half year; and the repairs and renewal fund also remained as before. The Company had the sum of £130,000 on deposit. The expenditure on capital account amounted on March 31 last to £1,353,182, including the sum of £643 spent during the half year. The gross rental for the six months from Lady-day last was £124,998; being an increase of £3114 on that of the corresponding period of last year. The water-rental received was £116,683; and the balance to the credit of the dividend and interest account was £165,486.

The Chairman, in moving the adoption of the Directors' report and the accounts, with the report of the Auditors, said he thought the half year had been the most anxious and hardest the Directors had experienced since he had had anything to do with the Company. The passing of their Bill through Parliament, empowering them to raise capital to provide additional storeage and other works necessary to enable them to supply the continually increasing number of houses in their district, had been a matter of very great anxiety to them. They had all done their best; but the gentleman to whom they owed their special thanks was their colleague Mr. Boulnois, whose action in Parliament had been most successful. They had the whole of the Government against them, which was most unfair and unjust; but nevertheless Mr. Boulnois succeeded in carrying the second reading of the Bill. The Directors had already expressed their thanks to their friend, to whom he was sure it would be gratifying to receive a similar recognition at the hands of the proprietors. Their works were in capital order. As they had said for some years past, all that they wanted—which they had been unable to get heretofore—was more storeage accommodation. They had been very fortunate, he thought, in being able to acquire a lease from the Ecclesiastical Commissioners, for 999 years, of about 140 acres of land at Barnes, in a convenient position to the Company's present works. This would enable them to erect reservoirs for 300 million gallons, and additional filter-beds; and he hoped they would have no necessity to go to Parliament again for some years to come. If the shareholders knew the difficulties which now beset them, and the determined opposition they met with from the London County Council and others, they would feel that it was most desirable not to go to Parliament if they could help it. They endeavoured to impose most unfair terms. This would not make so much difference to their Company as to some others; but if they succeeded in imposing these unfair terms, it would make a great difference to the consumers in their district, for in that event they would have to take something off the rebate of 10 per cent. which they now allowed their customers. The acquisition of the lease of the land referred to was a most desirable proceeding; and, in acquiring it on lease, the proprietors would see at once how they were compelled to look about them, in order to stop the very smart proceedings to which he had alluded on the part of their opponents. The rental they would pay to the Ecclesiastical Commissioners was £2000 a year. With regard to the recommendations of the Royal Commission as to storeage reservoirs in the Thames Valley, it was a very difficult matter to carry out, for some of the Companies would not have anything to do with it, while others were faint-hearted about it. As to the West Middlesex Company, they had said they would do their share, if equitable terms could be arranged. The Thames Conservators had introduced a Bill into Parliament, under which they were endeavouring to make the Company pay them £2000 a year more than at present. This in itself was a large sum. The Conservators, too, did not propose to give them any more water for their larger contribution; on the contrary, they would like to make them take a little less. The Directors would, however, do their best to oppose these unfair arrangements. They stated in the report that they had received a communication from the London County Council (who, however, were obviously not sincere), asking them whether they were willing to enter into negotiations for the sale of the undertaking. Their answer was that, when the Council made them a definite offer, they would consider it, although they were not at all anxious to sell the property. They would not willingly part with the undertaking, unless they obtained a fair price for the shareholders. They did not want to sell it even then; but they might in that case have to do so. Their Bill had so far passed the Committee of the House of Commons that they had approved the preamble; but they were now going to fight over the money clauses.

The Deputy-Chairman (Mr. J. Meyer) seconded the motion.

Mr. Walter Hunter said it was very unfair to saddle the Company with an increased payment to the Conservators, unless they received some return for it. If they should have to pay so much more to the Conservators, it would be only fair, especially now that the capability of the Thames had been so absolutely demonstrated by the Royal Commission, that they—and all the other Companies too—should be entitled to take more water from the river.

The motion was carried unanimously.

Resolutions were afterwards passed, declaring a dividend for the half year at the rate of 10 per cent. per annum; re-electing the retiring

Directors (Messrs. Meyer, Hunt, Bodkin, and Mackinnon) and the Auditors (Messrs. Solly, Dimsdale, and Pitt); and thanking the Chairman and Directors for their diligent attention to the business of the Company.

The CHAIRMAN, in acknowledging the last-mentioned resolution, referred in high terms to the special services of the staff in the past half year, and proposed a vote of thanks to them for the zeal and ability with which they had performed their duties. The Secretary and the Engineer (Mr. M. W. Hervey) had both had, he said, a great deal of anxious work to do; and they had done it exceedingly well.

The DEPUTY-CHAIRMAN seconded the motion, which was unanimously adopted.

Mr. HUNTER then proposed, and Mr. GIVENS seconded, a vote of thanks to Mr. Boulnois for the services rendered by that gentleman in Parliament in connection with the Company's Bill.

The motion was carried unanimously.

Mr. BOULNOIS, in acknowledging the vote, said he felt, when the proposal was made by the London County Council to reject the East London Company's Bill and their own Bill upon the second reading, that it was an extremely unfair course, and one which it was unusual to take in Parliament. A Private Bill full of details should in all cases, he thought, go to the proper tribunal to sift such matters—that was, a Select Committee; and he had been able to inculcate his own feeling in this matter into a certain number of members, who believed in the old traditions of Parliament, and from whom he received most valuable help. He was extremely glad to have been able to get their Bill before the Committee; and he thought it would eventually become law.

The proceedings then terminated.

MANCHESTER CORPORATION GAS SUPPLY.

The Noxious Vapours Abatement Association and the Price of Gas.

A few weeks ago, the Noxious Vapours Abatement Association wrote to the Gas Committee of the Manchester Corporation, asking that the price of gas should be reduced to 2s. per 1000 cubic feet. A reply was sent to the effect that "the Gas Committee consider the present time inopportune for any reduction in the price of gas." The Committee further resolved—"That it is not desirable to abolish or reduce the charges made for the hire of meters." Commenting on these decisions, the Secretary of the Association (Mr. F. Scott), in a letter to the *Manchester City News*, writes: "It is pitiful to think that all the evils which unquestionably result from excessively polluted air must be allowed to continue, in order that the present unfair incidence of rating may be maintained. Some of us now probably save a few shillings a year which have to be paid by large gas consumers, but all alike suffer surely, though not quite so directly, from the results of the smoke nuisance, which drives people out of the city for residence; thus reducing rateable value, and causing separation of classes—in itself the fruitful sources of numerous evils very far-reaching in their consequences." At the monthly meeting of the City Council, last Wednesday, the minutes of the Gas Committee, including the foregoing resolutions, came up for confirmation. In the continued absence of Mr. Brooks, the Chairman of the Gas Committee, in consequence of indisposition, Mr. Alderman Gibson, the Deputy-Chairman, moved the adoption of the minutes. With reference to the request that the price of gas should be reduced by 6d. per 1000 cubic feet, he explained that such a reduction would amount to about £60,000 per annum; and the abolition of meter-rents, as had been suggested, would come to a further sum of £10,000 a year. Although the Committee were bound to pay £64,000 into the city fund for the year ending March 31, 1894, no such sum had, as a matter of fact, been paid; and the deficiency of £35,000 had to be taken from the contingent fund to make up the amount, instead of increasing the price of gas. Alderman Higginbottom seconded the motion. Mr. J. Hampson moved, as an amendment—"That, in the opinion of this Council, the time has arrived when the rent charges on gas-meters within the municipal limits of the city should be discontinued, and that rent for gas-meters should cease to be charged on and after the 31st of March, 1894." He maintained that the meters were an integral part of the stock of the Corporation, and were simply used for the purpose of measuring the gas which was sold by the Corporation. It would, he said, be just as reasonable for a tax to be imposed for the use of scales in a grocer's shop, or the machine by which their coal was weighed, as to charge rents for the use of meters. There was a great deal of dissatisfaction existing with regard to this matter. Salford had not only abolished the charge on meters, but had reduced the price of gas. The price there was 2d. per 1000 cubic feet less than that charged in Manchester. Other corporations had abolished meter-rents; and it was a pity that a great city like Manchester should be behind in a matter of this kind. Mr. J. R. Wilson, in seconding the amendment, said his experience was that they charged 20 per cent. on the cost of the meter, which was sadly too much. On the suggestion of the Lord Mayor (Alderman Marshall), the amendment was made to read that this particular portion of the minutes should be referred back to the Committee; and on being put to the meeting in this form, it was rejected—37 voting for, and 40 against it. Some conversation followed as to the possibility of reducing the price of gas for other than illuminating purposes; but on this, as on the other points, Alderman Gibson could hold out no hope of immediate relief. He stated, however, that the decision of the Committee on the question of price referred only to one year; and that he and his colleagues were as anxious as any member of the Council for a reduction in the price of gas all round.

Newport Pagnell Gas and Coke Company, Limited.—The ordinary general meeting of this Company was held on Monday last week. The accounts presented showed that the receipts in the year ending March 25 last amounted to £1690, as compared with £1656 in the year 1892–3; the sundry stock and petty cash at the close of the financial year bringing the former amount up to £1727. The expenditure having been £1400, there was a balance of £327 to go to the profit and loss account. In their report, the Directors stated that they had lost £100 by the coal strike of last year. A dividend of 10 per cent., free of income-tax, was recommended.

ROTHERHAM CORPORATION GAS AND WATER SUPPLY.

Annual Financial Statement.

The Borough Accountant of Rotherham (Mr. C. H. Moss) has submitted his annual report to the Finance Committee. Concerning the gas-works, the account he has to give is not a cheering one. He says the past year has been a difficult period for the undertaking; and for the first time for many years, the result of the working (after paying the loan and sinking fund charges and for the gas consumed in public lighting) is a loss of £2156. The deficiency is accounted for (1) by a drop of £1560 in the income from gas-rents; (2) by an increase of £986 in the cost of coal, notwithstanding that 1034 tons less were purchased; (3) by the increased cost of renewals and repairs, which has been £2976 for the year, or £552 more than in 1892-3. It ought, however, to be stated that about £700 of this expenditure is of a special nature; being for a new scrubber and exhauster. The residuals have, on the other hand, produced £112 more than in 1892-3; £355 less has been paid for wages; £167 less for salaries; and several other small savings have been effected. The decrease in revenue, Mr. Moss remarks, is the most serious matter, because the dead weight expenses, such as rates and taxes, salaries, &c., are no less whether the output of gas be great or small; while the renewals tell heavily against a reduced revenue. The report gives the following information respecting the water-works: The income from domestic water-rents again shows a gratifying increase; being £231 more than in the previous year. The receipts for water for trade purposes, meters, and from the Rawmarsh Local Board, however, all exhibit a falling off; the reduction of income under those heads being £399 as compared with 1892-3. Then the expenditure has considerably increased; the repairs to the bye-washes at the Ulley reservoir having alone cost £482, and extra pumping at Ulley, in consequence of the dry season, involved an outlay of £171. The amount expended for coal for the pumping-engines at the central station and Aldwarke was £194 more than in 1892-3, the increase, of course, being in consequence of the miners' strike. There is an advance of £156 in loan charges; and the total result of the year's operations is a deficit of £662. Deducting last year's balance of surplus, there is a deficit of £598 to carry forward. Mr. Moss points out that the above expenditure is of an extraordinary nature, and not likely to occur again.

BOLTON CORPORATION GAS SUPPLY.

The Accounts for the Past Financial Year.

The balance-sheet of the Bolton Corporation Gas Department for the financial year ending the 25th of March last shows that the gross profit on the working is £51,202, and that the Gas Committee are enabled to hand over the sum of £16,906 in relief of the rates, besides setting aside £12,208 for the renewal of works and plant. Coal cost £50,985, as compared with £47,387 in the previous twelve months; but the receipts for coke advanced from £9716 to £14,693, owing mainly to the improved plant put down, which allowed of a less consumption at the works, and consequently of a larger quantity for disposal. The sum received for sulphate of ammonia showed an increase also; being £10,242, as against £5439 in the year 1892-3. For gas supplied there was received the large amount of £99,837, as compared with £99,189 for the previous twelve months. In other directions there have been slight increases; the total amount on revenue account being £133,676, as against £123,101 before. The principal items of expenditure were: Wages for carbonizing, £10,478; salaries of engineers, clerks, inspectors, &c., £4734; rents, rates, and taxes, £3292; and management expenses, £1383. The sum of £212 is put down for bad debts, as compared with £178 in the preceding twelve months. On profit and loss account, the following items appear on the debit side: Annuities, £14,460; interest on loans, £2374; dividend on Corporation stock, £4077; sinking fund, £1368; renewal account, £12,208; and the £16,906 proposed to be set aside in aid of the rates. On the reserve account there is a balance of £1792 to be carried forward, as against £1028 at the close of the year 1892-3. The annuities capitalized are given as worth £361,506; the mortgage loans are £80,550; and the redeemable stock is put down at a sum of £120,000.

At a meeting of the Town Council held last Wednesday, the Chairman of the Gas Committee (Alderman Miles) presented his annual statement as to the working of the department, based on the figures given above. He pointed out that, though the Committee had expended £6057 on capital account, which of necessity improved the value of the plant, they had depreciated that account by £6000 out of the accumulation on the reserve fund account—a step which he was sure would meet with the approval of the Council. Though they had added materially to the value of their works, the capital account did not stand any higher than last year; being, as a matter of fact, 14s. 2d. per 1000 cubic feet of gas sold, as against 14s. 3d. before. Having a large number of retorts which had never yet been needed, it followed that, if these were in full work (and this could be brought about without any additional expenditure), the capital would be relatively very much reduced, and would bring them near the goal of their ambition—viz., 10s. per 1000 cubic feet of gas sold. Coal and cannel had cost £3598 more than in the previous twelve months; and they had made 6 million cubic feet of gas less. The coal dispute was responsible for the extra cost; but he ventured to say that no gas undertaking came out of that lamentable affair better than that at Bolton. The Committee sat almost day by day; and coal was purchased in the best possible market. It was a singular fact that, though they made 6 million cubic feet of gas less, they sold upon the twelve months 4 million feet more. This was explained by the fact that the meter inspectors completed their work three days earlier than usual last year, and consequently this year had the advantage of that quantity of gas. Their loss by leakage and condensation had been reduced to the low figure of 4·37 per cent.; representing 34 million cubic feet. Adverting to the increased income from the sale of sulphate of ammonia, he observed that they had improved the working; obtaining 29¾ lbs. of sulphate per ton of coal carbonized, as against 23¾ lbs. in

1892-3. The placing of £12,208 to the renewal account out of profits, and the handing over of £16,906 in relief of the rates, he considered eminently satisfactory. In conclusion, he expressed his hearty appreciation of the assistance he had received from his Committee and the officials. Mr. Holt intimated that, at the next Council meeting, he should move that the price of gas be reduced 2d. per 1000 cubic feet. His argument was that a very large section of the ratepayers—and the poorest—could not participate in the benefit arising from the handing over of the £16,906, because they paid their rates in the rent. Other speakers followed in the same strain; but no amendment was submitted, and the Committee's proceedings were approved.

Bolton Corporation Water Supply.—According to the balance-sheet of the Bolton Corporation Water Department for the financial year ending the 25th of March last, there has been an increase in revenue; and the Committee, besides placing £2668 to the renewal fund, propose handing over £12,000 of the profit to the relief of rates. The income was £58,505—being nearly £3800 in advance of the previous twelve months; and the expenditure reached £43,836, as against £41,697 in the year ending March, 1893. The principal items on the revenue side were: Water supplied for domestic purposes, £33,037; trade purposes, £16,074; and Local Boards, £6003. The chief disbursements were: For officers' salaries, £1870; maintenance of works, £4648; rents, £1293; rates and taxes, £4262; interest on loans, £25,176; and instalment on loans, £3554.

Gas Supply in Constantinople.—As the new gas-works at Dolma Baghtche, Constantinople, have only been in operation rather more than four months, the following extract from the *Levant Herald* of the 25th ult. must be very gratifying both to the head of the department and to the Engineer, Mr. W. S. M'Gregor, who designed and is managing them: "The public are aware that the gas-works at Dolma Baghtche have supplied gas to certain departments of the State and to the public at the price of 50 piastres per 1000 cubic feet. Thanks to the spirit of progress that animates His Imperial Majesty the Sultan, and the solicitude he always shows for his subjects, the works have been reconstructed in such a manner as will ensure a regular supply of gas, and His Majesty has therefore ordered the price of gas and fittings (which are supplied by the works) to be reduced 20 per cent.; so that in future the price will be 40 piastres per 1000 cubic feet. This Imperial order has been communicated to the administration of the gas-works; and the reduction will take effect from the 1st of April in the current year."

Closing of a Coal Pit in South Yorkshire.—The action of Messrs. Newton, Chambers, and Co. in deciding to close one of their pits affords very practical proof of the condition of the coal trade. Last Saturday week, Mr. A. M. Chambers, President of the Coalowners' Federation, asked a deputation from the men employed in the Tankersley Thin Seam pit of the Company to meet him; and he informed them that, in consequence of the constant loss entailed by the working of the pit, the Directors had decided to close it. He gave particulars of the periods when the loss specially occurred; and, alluding to the recent strike, he said that the business was now in almost the same condition as last June, when the men were asked to accept a reduction in wages. There was no doubt that the maintenance of high wages in the present condition of the trade would lead to many pits being closed, especially those with thin seams. He assured the men, whatever their leaders might say to the contrary, that the coal trade was subject to the law of supply and demand, and that the present policy of the men made it impossible to work the pits except at a loss.

The Public Lighting Dispute at Liverpool.—In reference to the dispute respecting the terms on which the public lamps are lighted by the Liverpool Gas Company, a further letter from the Secretary (Mr. P. J. Garnett) was read at last week's meeting of the Corporation Watch Committee. After expressing the regret of the Directors that there should be any difference of opinion, he said: "The provisions contained in the agreement entered into between the Corporation and the Gas Company in 1860 have ever since been continuously recognized by both the parties as regulating the annual rent for gas supplied and services rendered in relation to the lighting of the public lamps. The Directors must regard those provisions as applicable to the year commencing the 1st of January, 1894, but would be quite willing, without prejudice, to negotiate with the Committee as to the price to be charged in future years, should it be desired on the part of the Corporation to re-open the question." The Committee resolved to reply that they do not consider there is any agreement between the Corporation and the Company binding the former to pay the price demanded by the latter; and that they will be glad to negotiate with the Directors as to the charge for the gas supplied during the current year.

The New Water-Works for Wakefield.—Last Wednesday, a special meeting of the Wakefield City Council was held to consider the expediency of promoting a Bill to empower the Corporation to construct filter-beds, a reservoir, and other water-works. Alderman Booth, the Chairman of the Water Committee, proposed a resolution to this effect. In the course of his remarks, he said that, owing to the dry season last summer, the water in the Ardsley reservoir became turbid. The ratepayers and the Corporation's outside customers complained; and the present resolution was the outcome of that complaint. The Corporation would have a large quantity of surplus water for sale when the Green Withens reservoir was completed; and therefore it behoved them to put the water in a state which could not be surpassed by any other authority vending water in the district. The maximum cost of the proposed works was calculated at £70,000; but at present they did not intend to expend half that amount. It was proposed to construct six filter-beds and a reservoir, and to lay a duplicate main into Wakefield; but only two of the filter-beds would be immediately constructed. The motion was carried unanimously. On Thursday the petition for the Bill was before Mr. Campion, the Examiner on Standing Orders of the House of Commons, who decided that, in consequence of the lateness of notices, the Standing Orders had not been complied with. Unless the Standing Orders Committee, before whom the matter will subsequently come, should decide to dispense with the Standing Orders, the Bill cannot proceed further this session.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners' Bill was passed by Lord Morley's Committee in the House of Lords on the 1st inst., and was ordered to be reported to the House for third reading. There was no opposition; an agreement having been come to with the Leith Dock Commission and the North British Railway Company, the only bodies who threatened opposition. The Commissioners propose to take power to borrow a further sum of £100,000, to be expended chiefly in the extension of the Leith works.

The Edinburgh and Leith Gas Commissioners have among them this year a gentleman—Kinnaird by name—who is giving promise of becoming a veritable thorn in the flesh. That there is good reason for expressing this opinion is shown by the remarks with which he was pleased to open a series of objections to contracts for stores, at a meeting of the Commissioners on Monday. He told them, in effect, that in Leith the public bodies are steeped in corruption; but that, until he found out that Edinburgh men were the same, he would give them credit for being honourable. What he said else it would be waste of time to follow him through. His objections were chiefly to the oil contracts. There were, in all, 18 offerers for the various oils, of which there might be about a dozen. The Works Committee recommended that one firm should get the contract to supply all the varieties. Mr. Kinnaird thought the Commissioners should accept the lowest offerer for every variety, which would have meant about a dozen contractors for oil. He did not appear to comprehend Lord Provost Russell's explanation of the disadvantages of the course he proposed, until it was pointed out to him about three times. He then fell back upon the observation that the Committee had been led by the nose by the Engineers, and that the Engineers had bungled the matter. It was most improper to make such an insinuation; and he should still be called upon to withdraw it.

Among other business before the Commissioners was a proposal that they should voluntarily place themselves under the regulation that they would not give contracts to any firm who do not pay the standard rate of wages. The proposal was sent to a Committee.

The Commissioners have entered into their coal contracts for the year after Whitsunday. For the Edinburgh works, the quantity purchased is 93,000 tons, at an average cost of 13s. 5·1d. per ton; but as there will be a considerable quantity of this year's contracts still to run, when these are added, the average rate is reduced to 12s. 10·9d. per ton. For the Leith works 43,000 tons of coal have been purchased, at an average price of 12s. 6·5d. per ton; but on account of undelivered coal from this year, the average rate is reduced to 12s. 4·5d. per ton. It is interesting to observe how great a decline there has been in the price of coal during the past three years. In March, 1891, the Commissioners contracted for coal for the Edinburgh works, at an average price of 20s. 8¾d. per ton; and for the Leith works, at an average price of 20s. 9¾d. per ton. The drop in price is nearly all upon the better classes of coal. Then the lowest price for the lowest class was 10s. 6d. while now it is only 8s. 6d. Three years ago the highest price for the best class was 36s. 6d. per ton, which was paid for Newbattle cannel; whereas it is now 25s. for Balbardie, and the next price is 22s. In both works the coal is divided into four classes; but the varieties are much more numerous. Thus, for the Edinburgh works there are no fewer than 28 pits on the order-book; and for the Leith works there are nine pits. Even these figures are reduced from what they were three years ago, when no fewer than 35 varieties were required for the Edinburgh works, and 16 for the Leith works. Managers in England may be surprised at the large selection which is made; but, of course, the reason is quite obvious—it being necessary to exercise great care in selecting and blending, in order to get and to keep up the high illuminating power that is demanded by Scotch consumers of gas. Three-fourths of the coal required is cannel; and splint is used sparingly.

The Dundee Gas Commissioners have been troubling themselves in a peculiar way over the passage of the Corporation Bill through the House of Lords. Some who were not privileged to get to London to assist in the doing of the little that was required of the Gas Commissioners, have waxed wroth at the extravagance of spending £20 per head upon so many gentlemen in London. I think four went; and when they were in London, the happy idea occurred to them that, as they had a Committee inquiring into oil-gas processes, they might as well see what there was to be seen in that line in connection with the London Gas Companies. One of the members of the Committee was, however, at home in Dundee; and the resolution necessitated his being sent for. The summons was joyfully obeyed by the absentee; and the Committee went to Beckton to see the process of carburetting water gas with oil as worked there. They have not yet reported upon what they saw; and the information that they were there would not have transpired, had it not been that some of the members protested against the gentleman being summoned to London to inspect oil-gas plant. What a wonderful attraction a visit to London has to public men. I believe that, were inquiries into Private Bills to be conducted at home, to many the charm of public life would be gone.

The Commissioners held a meeting on Wednesday, at which, among other business of less interest, it was reported that the amount of gas rental collected for the ten months ending Feb. 28 was £53,575, and in March, £7944—making a total for the eleven months of £61,520. As compared with the corresponding period of the previous year, that showed a decrease of £9386. Mr. Mitchell, the Convener of the Finance Committee, said that, without forestalling the annual balance-sheet, he might state that the amount of coal carbonized during the year had been fully 45,000 tons, as against an estimated quantity of 50,000 tons; and the make of gas per ton of coal was about 10,450 feet, as against 10,000 feet estimated. The demand for gas, owing to nearly all the public works in the city being on short time during the winter, fell off very much; the quantity delivered during the year being only 475,750,900 cubic feet, or 27,203,700 feet less than last year. Had they got only the estimated extract from the coal, the quantity of gas would have been 450,000,000 feet; but the extra yield of about 450 feet per ton represented a considerable sum of money. They had also been favoured with better prices than they expected for their sulphate

of ammonia (about £2 10s. per ton), which, on their make of between 400 and 500 tons, represented a considerable sum. On the whole, he was hopeful that their year's transactions would turn out pretty well; and he did not look for any increase on the cost of gas next year. It was reported that contracts for 38,000 tons of coal had been accepted, which, with the stock on hand and the undelivered contracts, would amount to 54,000 tons. The price was 12s. 2d. per ton, which was a shade cheaper than last year.

The Directors of the Kinross and Milnathort Gas Company have resolved to erect a new bench of retorts for coal and oil gas making.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 5.

Sulphate of Ammonia.—An unsettled feeling still prevails; and the paucity of orders practically leaves the market at the mercy of the speculators. Quotations are in consequence unreliable; and those made by the dealers deflect very considerably from the prices realized by makers. That there will still be many requirements during May cannot be denied; and much depends upon how the transactions will be completed—whether they will find their way to the legitimate sources, or whether they will be intercepted by the operators, who reckon upon a further fall. The latter *modus operandi* seems to be in vogue at present, and may continue for some time; but surely, in the event of some larger orders, the limits of prudence would be exceeded as the stocks in the country in first hands are by no means large. A little more activity is noticed recently as far as Spain and the Colonies are concerned; but the shipments on the whole show a further falling off during April. Nitrate is dull, at about 10s. per cwt.

LONDON, *May* 5.

Tar Products.—Distillers are now having a busy time in getting stocks of pitch out before the hot weather sets in. There is a dearth of stocks which should operate in preventing lower prices, although it is difficult to see how fuel makers can pay present prices with coal at to-day's value. Benzols are moving off a little more freely; and several important transactions are recorded. Creosote is dull, and difficult to sell—prices depending very much upon position; but very low quotations are reported in some districts. Carbolic acid, as well as crystals, are in much better request, which is likely to continue for the next few months. Several important tar contracts have been let at the following prices, according to position, delivery, and quality. Current prices are: Tar, 12s. to 16s. Pitch, 27s. Benzol, 90's, 1s. 1d.; 50's, 1s. 4d. Solvent naphtha, 1s. 2½d. Creosote, 1½d. Creosote salts, 25s. Toluol, 1s. 8d. Cresylic acid, 1s. 1d. Crude benzol naphtha, 30 per cent., 5¾d. Carbolic acid, 60's, 1s. 8d. Anthracene, "A," 1s. 1d.; "B," 10½d.

Sulphate of Ammonia continues weak; and very little new business is reported. Stocks are low; and makers are therefore fortunately indifferent to the "bear" operations going on in this market. Quoted prices vary from £12 15s. to £13, less 3½ per cent.; while, for forward delivery, £13 10s. can be obtained. Gas liquor is quoted at 9s. to 11s. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—With the commencement of the month, there has been some slight easing down in prices upon round coals, but no generally quotable reduction. In the open market, very low figures are quoted here and there, to get hold of business; but they would seem almost to have got very near to the minimum they are likely to touch under existing circumstances, and the question now chiefly uppermost is the probability of some move before long for bringing forward a proposal for a reduction in wages. The preliminary steps in this direction are already being taken by the Lancashire colliery owners, who are under the Conciliation Board, and who have been securing the assent of other colliery owners not connected with the Board to abide by such decisions as the Conciliation Board may come to with regard to the question of wages. It scarcely, however, seems likely that the coalowners would be able to get together as strong a combination as they did last year to carry out another movement for reducing wages, although on all sides they are vigorously protesting that a reduction has become absolutely necessary. With regard to prices, quotations, so far as they can be given, remain much the same as last month. Best Wigan Arley coals average 11s. to 11s. 6d., with one or two special quotations at 12s.; Pemberton four-feet and seconds Arley, 10s. to 10s. 6d.; and common round coals, from 7s. 6d. to 8s. for steam and forge coals, to 8s. 6d. up to 9s. for gas-making qualities. There is, however, nothing of any weight being done; and contracts for the most part are being held back, owing to the uncertainty as to the future. The shipping demand for steam coal also continues excessively dull; and Lancashire coalowners complain that they are being cut out of the market completely by North Wales, and coal from other districts. Delivered at the ports on the Mersey, ordinary Lancashire steam coal is still quoted at about 8s. 6d. per ton; but there are lower sellers in the market. Engine classes of fuel move off fairly well; but here and there stocks of slack are even now reported to be accumulating, and prices, although maintained at late rates, are scarcely strong in all cases. At the pit mouth, common slack averages 5s. to 5s. 6d.; best qualities, 6s. 6d.; with burgy and through-and-through coal quoted at 6s. 9d. up to 7s. 3d. per ton.

Northern Coal Trade.—The coal trade in the North-eastern district is rather quieter, though there are tolerably large deliveries on contract, which keep some of the collieries very fully employed. The prospect of some restriction of the output seems more likely; and this and the approach of the holidays will induce buyers to increase their stocks, so that there may be in a week or two revived animation. But at present there is dulness, especially in the gas and household coal districts; and some of the pits have had very short time. Best Northumbrian steam coal is steady; and as the Baltic shipments are now taking place in earnest, some of the collieries have orders booked ahead for a considerable time. The price remains at from 10s. to 10s. 1½d. per ton f.o.b.; but with the more regular working of the steam coal collieries, there is an increased production of small steam coal, the price being a little easier at 4s. 6d. per ton. Gas coals are steady in price; but there is only a limited demand at the present time. The prices quoted for odd cargoes vary from 7s. 3d. to 8s. per ton f.o.b., varying according to position of colliery, &c. There is little or no change in manufacturing coal; but requirements for the shipbuilding yards are larger. Smithy coal is steady. Coke is rather firmer, the local consumption increasing, as more furnaces are now in blast; and there is also a little fuller inquiry again for export. The price of best Durham coke may be given as about 13s. to 14s. per ton f.o.b. Gas coke is rather more limited in output; price unaltered.

Scotch Coal Trade.—This week has seen the step taken by the coalmasters in the West of Scotland which has been threatened for some time—namely, a reduction of the miners' wages. The amount of the reduction is 1s. per day. It would seem that the men are prepared to acquiesce in it, which will be wise, because trade is not improving. Coalmasters during the strike in England neglected their foreign orders, and sent their coal to England, where they got much higher prices. Now they find it difficult to get back their customers from abroad; and the reduction is intended chiefly to attract them. Otherwise there is no change in the situation. The prices quoted are: Main, 6s. 9d. to 7s.; ell, 8s. 3d. to 8s. 6d.; splint, 7s. 6d. to 7s. 9d.; and steam, 9s. to 9s. 3d. per ton f.o.b. Glasgow. The shipments for the week amounted to 153,293 tons—a decrease as compared with the previous week of 10,039 tons, and as compared with the corresponding week of last year of 5127 tons. For the year to date, the total shipments have amounted to 2,304,527 tons—an increase over the same period of last year of 337,884 tons.

The Wrexham Corporation and the Electric Light.—The Wrexham Corporation last Tuesday decided to acquire the Provisional Order of the Wrexham District Electric Light Company for £350.

The Profits of the Stockton Gas-Works.—It was reported at the meeting of the Stockton Town Council last Tuesday that the profits of the Gas Department for the year ending March last had been £4009, as compared with £3030 in the previous year; this being after £3499 had been placed to the sinking fund account.

Water-Works for St. Austell.—The inhabitants of St. Austell have been labouring under considerable difficulties for a long time past owing to the want of an adequate supply of water. The Local Board have now succeeded in discovering a suitable stream at Carne Stents; and they have sought the sanction of the Local Government Board to the raising of £4000 with which to execute the necessary works. An inquiry into the matter was held last Friday week by Mr. F. H. Tulloch, M.Inst.C.E.; and it was then stated that the stream yields a copious and pure supply, but that the Board had been unable to lease the water rights for a longer period than 60 years.

Georgetown (British Guiana) Gas Company, Limited.—The report of the Directors of this Company for the half year ended Dec. 31 last states that the profit (£901) was less than that of the preceding six months; but the net available balance (£1204) is sufficient to enable the Directors to recommend the declaration of a dividend on the preference share capital at the rate of 8 per cent. per annum, and on the ordinary share capital at the rate of 5 per cent., both less income-tax (except upon those dividends payable to the local shareholders). The business of the Company has somewhat decreased since electricity has been employed for public lighting; but the Directors have resolved to reduce the price of gas to such an extent as will render it available for cooking as well as for lighting purposes.

The Stockport Corporation Provisional Order.—At a special meeting of the Stockport Town Council on the 17th ult., the Town Clerk, referring to the Local Government Board inquiry which was held a short time since relative to the application of the Corporation for a Provisional Order to repeal certain sections of the Improvement Act, and giving new borrowing powers, stated that he had received that morning an intimation from the Board confirming the proposals; and the Order had now only to come before Parliament for formal sanction. Under the Order, the Corporation could borrow as much as they liked for the purpose of gas-works extensions and improvements (the Act only now applying to gas-works), providing they obtained a majority on the Council and the confirmation of the Local Government Board, and arranged a sinking fund. The Board at first put in a clause limiting the borrowing to £40,000. He (the Town Clerk) proceeded to London, and saw the officials of the Board, and stated that this would not do. The Corporation might want to enlarge the gas-works very extensively if the borough was extended; and it would be a disadvantage not to be able to borrow a larger sum than £40,000 without having recourse to an Act of Parliament. The Board saw the point, and allowed the section to be expunged.

The Finances of the Rochdale Corporation Gas and Water Committees.—The various Committees of the Rochdale Corporation have recently held meetings to consider and pass their estimates for the year 1894-5; and during the proceedings, the financial results of the past twelve months were produced. With regard to the Gas Committee, they end a most troublesome year with a very satisfactory report. At one time it was almost taken for granted that the exorbitant prices charged for coal during the prolonged dispute between the miners and the coalowners had already absolutely precluded the possibility of the department declaring a profit; but so far from this being the case, the profits for the year are £3809, as against £4289 in the preceding year. During the year the income of the department improved by £4457. The revenue from gas increased by £1469; from sulphate of ammonia, by £1788; and from coke, by £1718. The manufacturing expenses, however, increased by no less than £5164. The progress made by the Water Committee is stated to be very slight. The deficiency to be provided for in the rates is £7090, against £7420 last year. Respecting the revenue of the department for the past year, there is a gain of £1020; the totals being £29,769, against £28,749. But, on the other hand, the expenditure has increased from £36,474 to £36,859—a difference of £385.

Gas Supply in the Midlands.—The working of the West Bromwich gas undertaking in the past financial year resulted in a loss of £265. At Smethwick, on the other hand, the Gas Committee of the Local Board have arranged with the Finance Committee to pay over to them, out of the gas profits, £600 to the credit of the general district rate account.

Lincoln Corporation Water Department.—A comparative statement of their income for the last two years has been issued by the Water Committee of the Lincoln Town Council. The water-rents in the past year amounted to £6703, as against £6533 in 1892-3; the meter supply produced £2617, as against £2618; and water for building purposes realized £104, as against £73.

The Electric Lighting Question at Folkestone.—At a mass meeting of ratepayers held at Folkestone on Monday, the 23rd ult., a resolution was passed protesting most emphatically against the electric lighting scheme which the Town Council propose to carry out at a cost of £35,000. The figures put forward by one of the members of the Council (Mr. Daniel Baker), to which reference has already been made in the JOURNAL, were very much in evidence. The scheme was characterized as extravagant and ill-advised; and its abandonment was demanded.

Critical Condition of the Leicester Water Supply.—Grave anxiety is being experienced by the Leicester Corporation Water Department at the threatened water famine, in consequence of the remarkably small rainfall. The reservoirs are 15 feet below the weir; and the deficiency amounts to some 580 million gallons. The water supply for about six months has been cut off every night at eight o'clock; and although a fresh auxiliary supply of 400,000 gallons daily has been introduced, the stock of water is gradually diminishing. Several hundred workmen are engaged completing pipes and temporary works from the site of a new reservoir which has been commenced; but, even with the relief thus afforded, the supply will, it is stated, have to be further largely reduced, unless there is a heavy rainfall.

Norwich Electricity Supply Company, Limited.—The third annual meeting of this Company was held on the 24th ult., under the presidency of Mr. F. W. Harmer. The report presented stated that during the three months ending Dec. 31 last the amount received for current was £805, which would pay the cost of producing it, including salaries, wages, coal, and all other station expenses, the office expenses of the Company for twelve months, and the interest due to the bank—leaving a balance of £237, which it was proposed to carry forward. In moving the adoption of the report, the Chairman remarked that, although the Company had been but three months at work, they had been able to pay their way from the beginning; and it was only a question of a short time before they arrived at a dividend-paying stage. The report was adopted.

Gas v. Electric Lighting in the City Streets.—Our contemporary *Lightning* has lately been rejoicing over what it regards as the triumph of electricity for the public lighting of the City of London, as exemplified by the fact that the gas lamp-posts have been removed. In fact, so desirous are the enterprising conductors of that periodical of accurately recording this event, that they have, in a recent issue, reproduced two photographs of the operation; and we are called upon to confess that, "in a fair fight, gas has been fairly beaten off the field." We shall do nothing of the kind. We shall simply admit that the citizens have decided to adopt a different illuminant in the streets; and we can only express the hope that they may be satisfied with it, and its cost. We may perhaps be pardoned for referring, in this connection, to what took place at the meeting of the Commissioners of Sewers on Tuesday last. Mr. Ross, reporting on the number and cost of the gas-lamps displaced by the arc lamps in the main thoroughfares of the City, said the electric lights, numbering 479 arc lamps, cost £12,454 per annum, whereas the 1315 gas-lamps cost, for lighting and maintenance, £4631 per annum—a difference of £7823. Mr. M'Carthy, commenting upon this enormous increase, asked whether the Commissioners intended lighting the side streets by electricity, which would cost another £10,000 a year. The answer given was that the Streets Committee were considering the point. The citizens would do well to follow their example.

Exhibitions of Gas Appliances.—Exhibitions of gas cooking and heating appliances were held by the Davis Gas-Stove Company, Limited, from the 24th to the 27th ult., at the St. John's Parish Room, Bristol, and at the Corn Exchange, Swindon; Miss A. A. Hunt giving cookery lectures at the former, and Mrs. Hunter at the latter place. A similar exhibition was held by them from the 1st to the 4th inst. in the Temperance Hall, Lye (Stourbridge), with the assistance of Miss E. M. Lucas; and they are now exhibiting in the Albert Hall, Portsmouth, with Mrs. Hunter as the lecturer.——During the week ending the 28th ult., Messrs. Fletcher, Russell, and Co., Limited, held attractive exhibitions of their appliances at Accrington, with demonstrations by Mrs. H. M. Young; at Rickmansworth, with lectures by Miss Rose Brown; and at Uttoxeter, where Miss Roberts illustrated the usefulness of gas in cooking.——Under the auspices of the Colchester Gas Company, a complete collection of gas appliances was shown in the Corn Exchange last week. Gas-stoves were exhibited by Messrs. Fletcher, Russell, and Co., and the Carron Company; and various local firms had displays of gas fittings, lamps, engines, and other goods. The lectures were confided to Miss Rotherham and Miss Dudgeon. ——An exhibition of the gas stoves and appliances manufactured by Messrs. R. and A. Main was held at Perth last week; a series of lectures being delivered by Miss Burton. The firm also exhibited their appliances at the Moss Side Liberal Club Hall, Manchester; and Miss Parker demonstrated their utility in a series of cookery lectures.—— The Gas Committee of the Hamilton Town Council are holding an interesting exhibition in the Town Hall, in conjunction with which Miss Philipps, of the South Kensington School of Cookery, is delivering a course of practical lectures.——On Monday last week, an exhibition of gas appliances was opened, under the auspices of the Stockport Corporation, in the Mechanics' Institute in that town. The stove exhibits were furnished by Messrs. Fletcher, Russell, and Co., Limited, Messrs. Richmond and Co., Limited, and Messrs. R. and A. Main; and cookery lessons were given by Miss Owen.

Cleobury Mortimer Gas Company, Limited.—A Company has been registered under the above title, with a capital of £500, in £1 shares, to supply gas in the town named, in Shropshire.

Danger of Contamination of the Chalk Areas in Surrey.—Messrs. R. Walton and A. Royle, two of the Inspectors of the Local Government Board, a short time ago concluded a lengthy inquiry at Sutton, Surrey, into an application made by the Epsom Joint Hospital Board for permission to borrow £2500 to purchase land to the west of Banstead Downs, whereon to erect a fever hospital. Mr. Macmorran conducted the case on behalf of the Joint Board; and Mr. Freeman opposed on behalf of the Sutton Water Company and others. The site, it was stated, was well isolated, and in every way fitted for the purpose to which it was intended to be put. The excreta, &c., from the typhoid patients would be burnt; but the rest of the sewage would be treated by irrigation on the land. Mr. Baldwin Latham, M.Inst.C.E., was the chief witness called by the opposition; and he contended that, if the sewage were treated as proposed, there was a very considerable risk of the underground channels from which the Sutton Water Company obtain their supply being injuriously affected. Though any deleterious matter put on the site would have to percolate 150 feet, and travel 2½ miles in a straight line before it reached the Company's well, the chalk was so rubbly and full of fissures that any poisonous matter getting into one of them might travel to the other without undergoing the least purification. If poison once entered the water, it would not matter whether it was from one patient or a million, the effect would be the same on the inhabitants of the large district supplied by the Company. There was also great liability that, when the demands were made upon this area (which were sure to be made sooner or later) for supplying London with water, putting any of these large institutions on the chalk would be a source of danger. There were too many of them already; and they ought to be diminished as much as possible. It was curious that the authorities had planted so many asylums on the top of the chalk, without the slightest regard to the future water supply of the district. Mr. P. Birch, M.Inst.C.E., Mr. Barker, F.G.S., and others, gave evidence to similar effect; while on behalf of the Joint Board, Mr. Whittaker contended that there was no probability of the water from the site flowing to the well, and that, even if it did, it would have been thoroughly purified before it reached there.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 836.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES				£ s. d.
590,000	10	12 Apl.	10½	Alliance & Dublin 10 p. c.	10	17⅛—18⅛	..	5 13 6
100,000	10	,,	7½	Do. 7 p.c	10	12—13	..	5 15 4
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	107—109	+1	4 11 9
100,000	20	14 Dec.	8	Bahia, Limited	20	10—11	..	14 10 10
200,000	5	15 Nov.	6½	Bombay, Limited	5	5¼—5⅝	+⅛	5 13 0
40,000	5	,,	6½	Do. New	4	4—4⅛	+⅛	5 15 6
380,000	Stck.	28 Feb.	11½	Brentford Consolidated	100	217—222	..	5 3 7
180,000	,,	,,	8½	Do. New	100	165—170	..	5 0 0
220,000	Stck.	15 Mar.	11½	Brighton & Hove Original	100	210—215	..	5 6 11
888,500	Stck.	28 Feb.	5	Bristol	100	107—110	..	4 10 11
320,000	20	29 Mar.	11½	British	20	45—47	..	4 15 10
50,000	10	28 Feb.	11½	Bromley, Ordinary 10 p. c.	10	21—22	..	5 4 7
51,510	10	,,	8½	Do. 7 p. c.	10	15½—16½	..	5 3 0
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	5½—6½	..	3 1 6
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	101—104	..	5 15 5
150,000	20	28 Feb.	8	Cagliari, Limited	20	26 - 27	..	5 18 6
550,000	Stck.	12 Apl.	12½	Commercial, Old Stock	100	250—255	..	4 18 0
165,000	,,	,,	9½	Do. New do.	100	190—195	..	4 17 5
160,762	,,	14 Dec.	4½	Do. 4½ p. c. Deb. do.	100	132—137	..	3 5 8
800,000	Stck.	14 Dec.	13	Continental Union, Limited	100	232—237	..	5 9 8
200,000	,,	,,	10	Do. 7 p. c. Pref	100	204—209	..	4 15 8
535,000	Stck.	28 Feb.	5	Crystal Palace Ord. 5 p.c. Stk	100	105—110	..	4 10 11
486,090	10	31 Jan.	10	European, Limited	10	22—23	..	4 6 11
354,060	10	,,	10	Do. Partly paid	7½	15½—16½	..	4 10 11
5,646,590	Stck.	14 Feb.	12	Gaslight & Coke, A, Ordinary	100	228—233	..	5 3 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	98—102	..	3 18 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	273—278	..	3 12 9
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	130 -135	..	3 14 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	192—195	..	3 16 11
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	175—180	..	3 17 9
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	272—277	..	3 12 3
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	165—170	..	3 10 7
1,061,150	,,	14 Dec.	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	132—137	..	3 5 8
908,000	,,	,,	6	Do. 6 p. c. do	100	177—182	..	3 5 11
3,800,000	Stck.	15 Nov.	12	Imperial Continental	100	215—220	−2	5 9 1
75,000	5	14 Dec.	6	Malta & Mediterranean, Ltd.	5	4½—5	..	6 0 0
560,000	100	2 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	109—111	..	4 10 1
541,920	20	15 Nov.	5	Monte Video, Limited	20	13½—14½	..	6 18 0
150,000	5	30 Nov.	8	Oriental, Limited	5	5⅜ - 6⅝	..	6 8 0
60,000	5	29 Mar.	7	Ottoman, Limited	5	3⅞—4⅛	..	7 7 4
166,870	10	31 Jan.	2	Pará Limited	10	2 2½	..	8 0 0
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	102-10⅝	+1⅛	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	97—102	..	5 17 8
150,000	10	26 Apl.	6	San Paulo, Limited	10	9½-10⅜	+⅛	5 14 3
500,000	Stck.	28 Feb.	15½	South Metropolitan, A Stock	100	315—320	..	1 10 11
1,350,000	,,	,,	12	Do. B do.	100	253—258	..	4 13 0
260,000	,,	,,	13	Do. C do.	100	260—265	..	4 18 1
750,000	,,	17 Jan.	5	Do. 5 p. c. Deb. Stk.	100	153—157	..	3 3 8
60,000	Stck.	28 Feb.	11½	Tottenham & Edm'nton, "A"	100	210—215	..	5 7 0
				WATER COMPANIES.				
745,967	Stck.	29 Dec.	10	Chelsea, Ordinary	100	275—280	+2	3 11 5
1,720,252	Stck.	12 Apl.	8	East London, Ordinary	100	220—225	+4	3 11 1
544,440	,,	29 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	147—150	..	3 0 0
700,000	50	14 Dec.	8½	Grand Junction	50	114—118	+1	3 11 10
708,000	Stck.	28 Feb.	11½	Kent	100	288—293	..	3 18 6
1,043,800	100	29 Dec.	9½	Lambeth, 10 p. c. max.	100	250—255	+2	3 14 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	203—207	+2½	3 12 5
310,000	Stck.	29 Mar.	4	Do. 4 p. c. Deb. Stk.	100	132—135	..	2 19 3
500,000	100	14 Feb.	12½	New River, New Shares	100	365—370	..	3 5 6
1,000,000	Stck.	31 Jan.	4	Do. 4 p. c. Deb. Stk	100	133—136	..	2 18 10
902,300	Stck.	14 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	160—165	+3	3 12 9
126,500	100	,,	6	Do. D 7½ p. c. do.	100	147—152	..	3 19 0
1,155,066	Stck.	14 Dec.	10	West Middlesex	100	267—272	+2	3 13 7

* Ex div.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO.,

TELEPHONE No. 2698.

HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

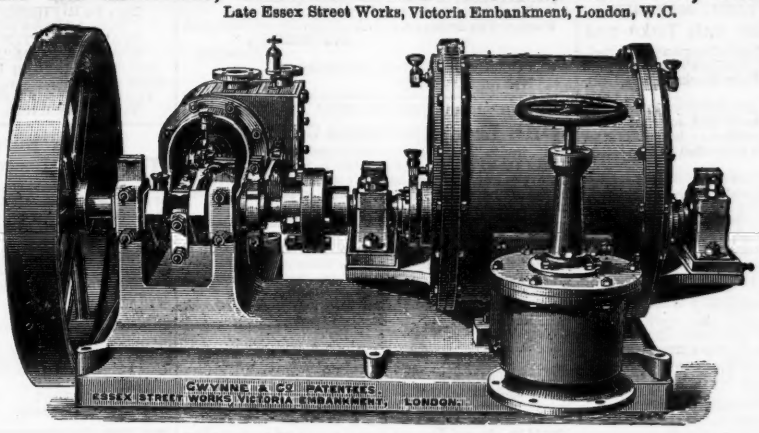
Late Essex Street Works, Victoria Embankment, London, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co.; for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 20,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works raising Sewage, &c.

Also GIRARD nd other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent. All communications *re* OXIDE to be addressed to PALMERSTON BUILDINGS, E.C.

BRIN'S Oxygen Company, Limited, Westminster. ANDREW STEPHENSON, Agent.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 200 British Gas-Works. [See Advt., p. 875.]
ANDREW STEPHENSON, 182, Gresham House, Old Broad Street, LONDON, E.C. Telegram: "Volcanism, London."

LIQUOR, Tar, and Spent Oxide wanted. BROTHERTON AND Co., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and adroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

CHARTERING, FORWARDING, AND INSURANCE.

ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See last week, p. 817.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

JAMES LAWRIE & Co. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock Oldham."

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

MR. J. C. CHAPMAN, Fellow of the Chartered Institute of Patent Agents, advises on all matters connected with LETTERS PATENT FOR INVENTIONS and the PROTECTION OF TRADE MARKS, &c., at home and abroad. Preliminary Information and Handbook on application.
70, Chancery Lane, LONDON, W.C.

WATER-WORKS Manager seeks Appointment—Engineering and Clerical. Age 34. First-class references.
Address No. 2367, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Son of a Gas Manager (aged 20), a Situation as an ASSISTANT MANAGER. Understands the routine of a Gas-Works. Could assist in Drawing.
Address No. 2382, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

YOUNG Gentleman (aged 23) is desirous of obtaining a post as CLERK to a Gas Company. Six years' experience. Good knowledge of the Prepayment System. Excellent testimonials.
State salary and locality to No. 2376, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS ACCOUNT-BOOKS, ETC.

THE Advertiser, having had many years' experience in Gas Office Book-keeping, is prepared to supply DRAFT FORMS OF GAS ACCOUNT-BOOKS, &c., hand-ruled to suit special requirements.
Address No. 2380, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore. Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

ALWAYS a Buyer of Spent Oxide, Tar, and AMMONIACAL LIQUOR.
Apply to J. HARDMAN, Milton, STAFFORDSHIRE.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO., VICTORIA PAINT WORKS, MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.
GAS PLANT CEMENT
FOR ALL LEAKAGES.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD

TAR.

BELGIAN Engineer, having excellent business connections, and able to furnish the highest references, is desirous of undertaking, for a good firm, the Agency for the SALE of TAR in Belgium.
Address No. 2383, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Manager for a Tar Distillery, with a view to Partnership.
Apply, by letter, giving age, references, and experience, and what capital at disposal, to No. 2381, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, two or three Gentlemen well acquainted with Gas Companies to sell commodity in constant use. State experience, what connection, and what district most suitable.
Apply, by letter, to No. 2375, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two or Three Travellers with undoubted connections with Gas Companies. Say in what part of England connection exists, and Salary required.

Apply, by letter, stating experience and full particulars, to No. 2373, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS AND ELECTRIC LIGHT MANAGERS.

THE Directors of the Salt Lake and Ogden Gas and Electric Light Company, Limited, are prepared to receive APPLICATIONS for the post of GENERAL MANAGER at their Works in Salt Lake City, Utah.

Applicants must have had considerable experience in a Gas-Works, and must have had charge of an Electric Light Station of importance; both Gas and Electric Lighting being in full operation at Salt Lake City and Ogden.

Applications will be treated as confidential; and a liberal Salary will be paid to a really first-class man.

Apply, by letter, with copies of Testimonials, to J. A. KELMAN, Secretary, Salt Lake and Ogden Gas and Electric Light Company, Limited, 251, Winchester House, Old Broad Street, LONDON, E.C.

SECRETARY TO GAS COMPANY.

THE Guildford Gas Company will, on the 24th of June next, require the services of a SECRETARY, whose duties, in addition to the ordinary duties of a Secretary, will be to superintend, and be responsible for, the laying of all Mains and Pipes, and all work in connection with the Company's Business outside the Company's Premises.

Salary, £250 per annum, no Residence or Extras.

Applications (with Testimonials, not exceeding three in number) to be sent to the Chairman of the Company, 138, High Street, Guildford, on or before the 24th of May next.

The person appointed will be required to give a Bond, with two Sureties, in the amount of £500 for the due performance of his duties.

Gas Offices, Guildford,
May 1, 1894.

LEWES GAS COMPANY.

THE Directors wish to secure the services of an experienced MANAGER at the above Works. One who thoroughly understands the Manufacture and Distribution of Gas on the most modern principles.

Applicants to state their Age, previous Experience, and Salary required, and when prepared to commence duty. The Directors provide House and Gas free.

Satisfactory references, or copies of not more than three recent testimonials as to ability, will be required.

Applications, endorsed "Gas Manager," to be sent to the undersigned on or before the 28th of May inst.

Canvassing the Directors will be held a disqualification.

EDWARD HILLMAN,
Secretary.

Gas Company, Lewes, Sussex.

WANTED, a good second-hand STATION METER; capacity, 40,000 cubic feet per hour.

Price and particulars to Mr. ISAAC CARR, Gas-Works, WIDNES.

FOR SALE—Small Gasholder Pillars, CHAINS, WEIGHTS, &c.; also a small GAS-PUMP. The Gasholder has been in use for Ten Years, and has been kept in good repair, and thoroughly painted.

Address GEORGE W. NELSON, Stone Merchant, Southowram, near HALIFAX.

FOR SALE—The Gas Committee of the Borough of Mansfield have FOR SALE four complete BEDS of seven RETORT-FITTINGS, with Tangye's Self-Sealing Mouthpieces, 16 in. by 15 in.; Ascension-Pipes, 6 in. to 5 in.; Arch and Dip Pipes, 5 in.; four D Hydraulic Mains, with four Regulating-Valves; sundry lengths of Foul Mains, and two Valves; fourteen 6-feet lengths of new Clay Ω Retorts for above.

The Ironwork has only been in use Twelve Months, consequently it is all in good condition.

For further Particulars and Information, apply to
ARTHUR GRAHAM,
Engineer and Manager.

MANNINGTREE AND MISTLEY GAS LIGHT AND COKE COMPANY, LIMITED.

THE Directors are prepared to receive TENDERS for a New or Second-Hand GAS ENGINE, EXHAUSTER, and GOVERNOR combined, to pass from 500 to 2000 cubic feet per hour.

The Directors do not bind themselves to accept the lowest or any tender.

F. M. MAULDON,
Secretary.

BOROUGH OF BURTON-UPON-TRENT.

TO COLLIERY PROPRIETORS.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, are prepared to receive TENDERS from Colliery Proprietors for the supply of 25,000 tons, or a portion thereof, of Best Screened GAS COAL, to be delivered, in Sender's or Railway Company's Trucks at the Gas-Works Railway Siding, Burton-upon-Trent, between the 1st day of July next and the 30th day of June, 1895.

The deliveries are to be made in such quantities and at such times as may be directed by the Manager.

Payment: Net Cash, Monthly.

Tenders, enclosed in an envelope, sealed and endorsed "Tender for Coal," are to be delivered to me at or before Ten a.m., on Thursday, the 24th of May inst.

The Council do not bind themselves to accept the lowest or any tender.

F. L. RAMSDEN,
Manager and Engineer.

Gas and Electric Light Works,
Burton-upon-Trent, May 4, 1894.

CAMBRIDGE UNIVERSITY AND TOWN GAS-LIGHT COMPANY.

TO TAR DISTILLERS AND OTHERS.

THE Directors of this Company will, at their Meeting on May 31, be prepared to receive TENDERS for the surplus TAR and the whole of the AMMONIACAL LIQUOR produced at these Works, for a period of One Year, from July 1 next ensuing.

Further Particulars may be had from the undersigned.

O. J. WEEKS,
Manager.

Gas Office, Sidney Street, Cambridge,
May 4, 1894.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Leek Improvement Commissioners invite TENDERS for the supply of best screened GAS COAL, NUTS, and CANNEL, for One Year from the 1st of July next, to be delivered at the Leek Station on the North Staffordshire Railway, at such times and in such quantities as may be required.

Further Particulars and Forms of Tender may be obtained from the undersigned.

Sealed and endorsed tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leek, by Four o'clock in the afternoon of Monday, the 21st of May inst.

The lowest or any Tender will not necessarily be accepted.

By order,
C. HENSHAW,
Clerk.

Town Hall, Leek,
May 3, 1894.

LYMM LOCAL BOARD.

THE above Board are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works, for a term of One Year from the 1st day of July, 1894.

The Tar and Liquor will be delivered free into Contractor's Boat on the Bridgewater Canal.

The Purchaser will have to enter into an agreement with the Board for the due performance of his contract.

Sealed tenders, stating price per ton for Tar, and price per ton for Liquor (5° Twaddel), to be sent to Wm. Mullard, Esq., Clerk to the Board, on or before the 22nd day of May, 1894, endorsed "Tar."

The Board do not bind themselves to accept the highest or any tender.

Further Particulars may be had on application to
WILLIAM SEVERS,
Manager.

Gas-Works, Lymm, Cheshire,
May 4, 1894.

LYMM LOCAL BOARD.

THE above Board are prepared to receive TENDERS for the supply of GAS COAL and CANNEL, to be delivered at their Gas-Works in Lymm for a term of One Year from the 1st day of July, 1894.

The probable quantities required are about 1000 tons of Gas Coal and 250 tons of Cannel, which must be freshly wrought and well screened, and free from Sulphurous Pyrites, or other objectionable matter; but the Board reserve the right of increasing or decreasing the quantities named.

The person whose tender is accepted will be required to enter into an agreement with the Board for the due performance of his contract.

Sealed tenders, stating price per ton delivered alongside the Works, to be sent to Wm. Mullard, Esq., Clerk to the Board, on or before the 22nd day of May, 1894, endorsed "Coal and Cannel."

The Board have no special form of tender, and do not bind themselves to accept the lowest or any tender.

Further Particulars may be had on application to
WILLIAM SEVERS,
Manager.

Gas-Works, Lymm, Cheshire,
May 4, 1894.

TENDERS FOR GAS COAL.

THE Brentwood Gas and Coke Company invite TENDERS for the supply of about 3500 tons of screened GAS COAL in Trucks at Brentwood Railway Station (G.E.R.) at per ton, to be delivered in the following quantities the second week of each month: June, 140 tons; July, 150 tons; August, 200 tons; September, 250 tons; October, 350 tons; November, 460 tons; December, 520 tons; January, 480 tons; February, 330 tons; March, 280 tons; April, 210 tons; and May, 180 tons.

Tenders (with analysis of the Coal to be supplied) and terms for monthly payments to be sent to the undersigned on or before the 19th inst.

The Directors do not bind themselves to accept the lowest or any tender.

C. A. FIELDER,
Secretary.

Brentwood, May 3, 1894.

CORPORATION OF MANSFIELD.

TENDERS FOR COAL AND CANNEL.
TENDERS FOR TAR AND AMMONIACAL LIQUOR.

COALS.—The Gas Committee are pre- pared to receive TENDERS for 1000 tons of CANNEL and 5000 tons of best screened GAS COAL, delivered at Mansfield Station for One Year from June 1, 1894, to May 31, 1895.

TAR AND LIQUOR.—TENDERS for TAR AND LIQUOR made during the Year from July 1, 1894, to June 30, 1895. Tenders for Liquor to be made either at a fixed Price per ton or on Sliding Scale regulated by the price of Sulphate.

Tenders, "endorsed," to be sent in to the undersigned on or before May 31, 1894.

Particulars and other Information may be obtained from Mr. A. Graham, Engineer and Manager of the Gas-Works.

By order of the Committee,
R. J. PARSONS,
Town Clerk.

May 4, 1894.

TENDERS FOR NEW GAS PLANT, ETC.

THE Tuam Gas Company invite TENDERS from Gas Engineering Firms for the supply, and erection at their Works in Tuam, of the following:—

RETORT-BENCH complete, including Fire-Clay Material, Hydraulic Main and Valve, Fitting and Mounting.
Two PURIFIERS, CENTRE-VALVE, and LIFTING APPARATUS.
STATION METER.
REPAIRS to GASHOLDER.

Specification and all Particulars to be had on application to the Chairman, James M'Donnell, Esq., Tuam.

The lowest or any tender not necessarily accepted.

Tuam, May 4, 1894.

TENDERS FOR COAL.

THE Rhyl Improvement Commissioners are prepared to receive TENDERS for the supply of about 3000 tons of GAS COAL, to be delivered during the Year ending June 30, 1895. Carriage free at their Siding (L. & N. W. Railway), Rhyl.

Sealed tenders, accompanied by Analysis, to be addressed to the Chairman of the Gas Committee, and endorsed "Tender for Coal," must be delivered at the Office of the undersigned not later than Thursday, the 17th inst.

Forms of Conditions and Tenders may be obtained on application to Mr. Leo. G. Hall, Gas-Works Manager, Paradise Street, Rhyl.

The lowest or any tender not necessarily accepted.

ARTHUR ROWLANDS,
Clerk to the Commissioners.

Town Hall, Rhyl,
May 2, 1894.

BUXTON LOCAL BOARD.

TENDERS FOR TAR AND LIQUOR.

THE Buxton Local Board invite TENDERS for the purchase of the surplus TAR and LIQUOR produced at their Works in Ashwood Dale, for One, Two, or Three Years, commencing from the 30th of June next.

Further Particulars and Forms of Tender to be obtained of Mr. G. Smedley, Gas Office, Buxton.

Tenders, endorsed "Tender for Tar and Liquor," to be addressed to the Chairman of the Gas Committee, and delivered not later than Twelve Noon on the 19th day of May.

The Board do not bind themselves to accept the highest or any tender.

By order,
JOSIAH TAYLOR,
Clerk.

Town Hall, Buxton,
May 4, 1894.

BUXTON LOCAL BOARD.

TENDERS FOR GAS COAL.

THE Gas Committee invite Tenders for the supply of good GAS COAL, for One or more Years, at the rate of about 1500 tons per annum, to be delivered at their Siding (on the Midland Railway) in Ashwood Dale, Buxton.

Tenders, endorsed "Tender for Gas Coal," addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall not later than Noon on the 19th day of May.

Forms of Tender and other Particulars may be obtained of Mr. G. Smedley, Engineer, Gas Office, Town Hall, Buxton.

The Board do not bind themselves to accept the lowest or any tender.

By order,
JOSIAH TAYLOR,
Clerk.

May 4, 1894.

THE Birstall Local Board are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR (the latter at 4°, 4½°, 5°, 5½°, and 6° by Twaddel's Hydrometer respectively), made by them at their Gas-Works, Birstall, adjoining the L. & N.W. Railway, for One, Two, or Three Years.

Tenders, stating price per ton for each article, and for the Liquor at each strength, sealed and endorsed, must be sent to me not later than Wednesday, the 16th of May inst.

The successful Contractor will, at his own expense, have to enter into an agreement and Bond with and to the Board for the due performance of his Contract.

The Local Board do not bind themselves to accept the highest or any tender.

For further particulars apply at the Gas-Works, or to
WM. MIDDLEBROOK, Solicitor,
Clerk to the Board.

Birstall, near Leeds,
May 4, 1894.

STAINES AND EGHAM DISTRICT GAS AND COKE COMPANY, LIMITED.

TENDERS FOR COAL.

THE Directors of this Company invite TENDERS for the supply and delivery of 6000 tons of EAST PONTOP, NEW PELTON, or other GAS COAL. The deliveries to commence after the 1st of November next, and continue during the period ending on the 30th of September following.

The Company's Works are on the Banks of the Thames.

Forms of Tender, containing further Particulars, may be obtained upon application to the Secretary; and all further Information can be obtained from the Manager, Mr. Thomas Webb, at the Works, Egham.

The Directors do not bind themselves to accept the lowest or any tender.

Sealed tenders to be sent to the undersigned on or before the 5th day of June, 1894.

JOHN ANTHONY ENGALL,
Solicitor and Secretary.

Staines, May 5, 1894.

NEW MILLS LOCAL BOARD.

TENDERS FOR GAS COAL, ETC.

THE New Mills Local Board invite TENDERS for the supply of best screened GAS COAL and CANNEL for the year ending June 30, 1895.

Estimated quantity: 1200 tons (more or less) of Coal and 300 tons (more or less) of best Cannel, to be delivered in such quantities as may be required from time to time at the L. & N. W. or Midland Railway Stations, New Mills.

Further Particulars may be had on application to Mr. E. Jones, the Gas Manager.

Tenders, with Analysis and full Particulars of the Coal and Cannel offered, to be sent in not later than May 26, 1894, to the undersigned, and endorsed "Tender for Gas Coal and Cannel."

TENDERS are also invited for the purchase of the surplus TAR and LIQUOR for One Year ending June 30, 1895.

The Board do not bind themselves to accept the lowest or any tender.

JOHN POLLITT, Clerk.

Town Hall, New Mills,
May 4, 1894.

LIVERPOOL UNITED GASLIGHT COMPANY.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the supply of 72,000 tons of CANNEL and 50,000 tons of COAL, to be delivered at the various Works of the Company, during the period of Twelve Months between the 1st of July, 1894, and the 30th of June, 1895.

Tenders will be received for the whole or any portion of the above quantity.

The Directors reserve the right to accept tenders for the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.

Full Particulars and Printed Forms of Tender can be obtained on application to the undersigned, at the Gas Office, Duke Street, Liverpool, to whom tenders, on the printed form, must be delivered, on or before Saturday, the 12th of May, endorsed "Tender for Cannel and Coal."

By Order,
WILLIAM KING,
Engineer.

Gas Office, Duke Street, Liverpool,
April 26, 1894.

CITY OF BANGOR.

COAL CONTRACT.

THE Water and Gas Committee of the Bangor Corporation invite TENDERS for the supply of 3000 tons of GAS COALS, to be delivered at the Bangor Railway Station, or on the Beach.

The Coal must be the best of its kind, well screened, and free from Bats, Pyrites, or other Impurities.

Parties tendering must fill up the form, which will be supplied on application, and give full information as to the Coal offered, and the Colliery from which they propose to supply.

Sealed tenders, addressed to the Chairman of the Water and Gas Committee, and endorsed "Tender for Coal," to be sent in not later than the 22nd day of May, 1894.

The Committee do not bind themselves to accept the lowest or any tender, and reserve the right to divide the contract between two or more firms.

Full particulars on application to

JOHN SMITH, Manager.

Gas-Works, Bangor, May 3, 1894.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

INCORPORATED BY ACT OF PARLIAMENT.

NOTICE is Hereby Given, that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 1st inst.,

Sir JULIAN GOLDSMID, Bart., M.P., in the chair, when the following RESOLUTIONS were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes."

"That a Dividend of 5 per cent. for the Half Year ended the 31st of December last, and a Bonus of 1 per cent. be declared upon the £3,800,000 Capital Stock of the Association, and that the same be payable, free of Income-Tax, on and after the 1st of June next."

"That Sir James Morse Carmichael, Bart., M.P., be re-elected a Director of the Association."

"That Thomas Henry Goodwin Newton, Esq., be re-elected a Director of the Association."

"That Colonel Josiah Wilkinson be re-elected a Director of the Association."

"That Montagu Somes Pilcher, Esq., be re-elected an Auditor of the Association."

"That the cordial thanks of the Meeting be given to the Directors for their able management of the affairs of the Association, to the Chairman for his conduct in the chair this day, to the Secretary and the London Staff, and to Mr. H. V. Lindon, the Agents, Engineers, and other Officers of the Association on the Continent."

And Notice is Further Given, that an EXTRAORDINARY GENERAL MEETING of the Proprietors was held on the said 1st inst., for the purpose of considering a proposal of the Board of Directors to AUTHORIZE the BORROWING of a SUM of MONEY, in accordance with the Provisions of the Imperial Continental Gas Association Act, 1893, by the issue of Debenture Stock, and, if approved, to order the same.

Sir JULIAN GOLDSMID, Bart., M.P., presided; and the following Resolution was unanimously passed:—

"That the Board of Directors be, and they are hereby, authorized, in accordance with the Provisions of the Imperial Continental Gas Association Act, 1893, to borrow sums not exceeding £500,000, by the issue of Debenture Stock, upon such terms and in such manner, and at such times, as they shall think fit, for the purpose of paying off the existing issue of Debenture Bonds as and when the same shall mature, or otherwise."

By order of the Board,
R. S. GARDINER,
Secretary.

21, Austin Friars, London, E.C.,
May 2, 1894.

CORPORATION OF MANCHESTER.

TENDERS FOR COAL AND CANNEL.

THE Gas Committee are prepared to receive, on or before Wednesday, the 23rd of May next, OFFERS of High-Class CANNELS and COALS suitable for gas-making, for delivery, at their Gaythorn, Rochdale Road, and Bradford Road Works, during a period of One, Two, or Three Years, commencing the 1st of July, 1894.

Particulars and printed Forms of Tender may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
April 13, 1894.

LINCOLN CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the Corporation of Lincoln are prepared to receive TENDERS for the purchase of the surplus TAR and the whole of the AMMONIACAL LIQUOR produced at their Works during the period of One Year, commencing on the 1st of July, 1894.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Residuals," must be delivered at the Gas Offices, Lincoln, on or before the 28th inst.

The Committee do not bind themselves to accept the highest or any tender.

Information as to quantities and other particulars may be obtained of the undersigned.

JNO. CARTER,
Manager.

Gas-Works, Lincoln,
May 5, 1894.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

Just published.
With numerous Illustrations and Tables, crown 8vo. cloth, 6s

THE

GAS ENGINEER'S LABORATORY HANDBOOK,

By JOHN HORNBY, F.I.C.
Honours Medallist in Gas Manufacture, City and Guilds of London Institute.

LONDON: E. & F. N. SPON, 125, Strand.
NEW YORK: 12, Cortlandt Street.

HUNTER'S

OXIDE OF IRON.

JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

11, BAY STREET, PORT GLASGOW.

Telegrams: "HUNTER, PORT GLASGOW."

Established 1872.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY

Strongly recommended where EXCESSIVE HEATS have to be maintained.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cubic feet.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton . . . . . 13,155 cub. ft.
Illuminating Power . . . . . 38·22 candles.
Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE
OR
E. FOSTER & CO.,
21, JOHN STREET, ADELPHI, LONDON, W.C.

COKE BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

For Exhauster Advertisement, see last week.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, E.C.,
And at STROUD, GLOUCESTERSHIRE.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,
66, ROBERTSON STREET, GLASGOW.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY
FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

London Office:

90, CANNON STREET, E.C.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[COPY.]

TUDHOE AND SUNDERLAND BRIDGE GAS COMPANY.

Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

GENTLEMEN,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.
Yield of Coke: 13½ cwt.
Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**
The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. COWAN,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

R. DEMPSTER & SONS, LTD.

Every Description of Gas Apparatus.

ELLAND, YORKS.

Old Kentucky Shale, From Kentucky.

TRADE O. K. SHALE. MARK.

THE MOST VALUABLE GAS ENRICHER NOW AVAILABLE IN ANY DESIRED QUANTITY.

S. Calvert Ford, Government Inspector at Washington, reports it as giving—

12,553 Cubic Feet of 50-Candle Gas, or 10,460 Cubic Feet of 60-Candle Gas,

AN EQUIVALENT OF 627,650 CANDLE-FEET,

Cargo Shipments to any PORT IN GREAT BRITAIN, on the CONTINENT, or SOUTH AMERICA.

PERKINS & CO., 228, PRODUCE EXCHANGE, NEW YORK.

Cable Address: "PERKINS, NEW YORK."

Telegraphic Address: "ROBUSTNESS, LONDON." EXCHANGE TELEPHONE 1756.

GASEOUS FIRING

FOR LARGE OR SMALL

RETORT-SETTINGS

PLANS, SPECIFICATIONS, AND ESTIMATES SUBMITTED.

SPECIALTIES

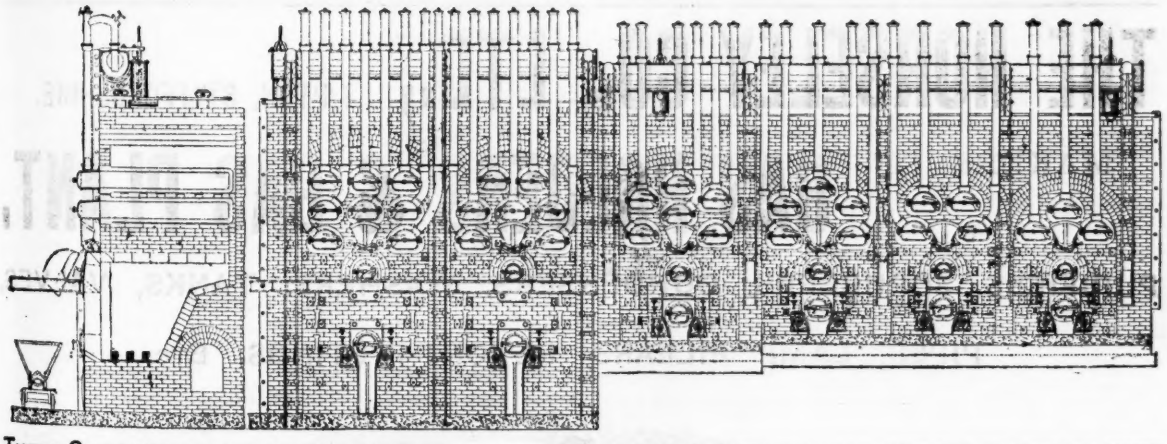
J. & H. ROBUS,

20, BUCKLERSBURY, LONDON, E.C.

ENGINEERS & CONTRACTORS

FOR THE ERECTION OF GAS AND WATER WORKS COMPLETE, AND FOR EXTENSIONS AND RENEWALS.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE ADAPTED TO THE REQUIREMENTS OF ALL GAS COMPANIES AND GAS CORPORATIONS, AND HAVE ALREADY BEEN VERY EXTENSIVELY ADOPTED. THEY ARE ERECTED UPON BOTH THE WORKING-STAGE AND SHALLOW-CHAMBER SYSTEMS AND EQUALLY SATISFACTORY RESULTS ARE GUARANTEED IN BOTH CASES. THE SETTINGS HAVE ATTAINED TO A MEASURE OF SUCCESS AND POPULARITY QUITE UNEQUALLED BY THAT OF ANY OTHER WITHIN THE SAME SPACE OF TIME. THE WORKING RESULTS OBTAINED, AND THE GENERAL SATISFACTION GIVEN, ARE DECLARED IN EVERY CASE TO EXCEED, AND IN MOST CASES CONSIDERABLY EXCEED, THE PATENTEE'S GUARANTEE. THE CONSTRUCTION AND WORKING OF THE PATENT PRODUCER AND THE PATENT CHARGING APPARATUS FOR SAME ARE ABSOLUTELY UNIQUE AND UNRIVALLED, AND ARE THE DELIGHT OF EVERY STOKER; WHILE IN EVERY OTHER PARTICULAR THEY SECURE THE HIGHEST RESULTS ATTAINABLE BY ANY REGENERATIVE SYSTEM, AND AT A MINIMUM OF COST.

Drawings and Specifications are furnished for the complete erection of Ovens, with or without Retort and Bench Mountings or complete erection undertaken if required, and carried out by specially Trained Workmen.

Further particulars may be obtained on application to the Patentee's Agents: C. M. HAMILTON, 5, Stuart Street, Shawlands, Glasgow; J. E. FISHER, Stourbridge; JOHN WALSH & SONS, Retort Builders, Halifax, Yorkshire; RICHARD TURNER, Retort Builder, Denton, Lancashire; and from the Principal Agent, R. F. HISLOP (son of Patentee), Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine quâ non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

SPENT LIMES NO LONGER WASTE PRODUCTS

Under G. R. HISLOP'S Patents, all Spent Limes are most effectually, economically, and continuously recovered at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it.

Descriptive Pamphlets and Terms from Agents as above.

INCLINED RETORTS,

FIRE BRICKS,
LUMPS, TILES,
BLOCKS, &c.

Special Bricks for Intense Heats.

GAS RETORTS.

CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

MOBBERLEY & PERRY,
Fire-Brick Works, STOURBRIDGE.

☞ Retort Setters sent to any part of the Kingdom.

WILLEY & Co.,

Gas Engineering Works, Commercial Road, Exeter,

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS.

GASHOLDERS, Telescope and Single Lift, any size. Some of the largest in the Kingdom, erected by this Firm, are giving the highest satisfaction.

PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing Works, adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **MR. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

Special reference and attention are invited to our

WET AND DRY METERS,

which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE.

MAKERS OF **GAS HOLDERS & GAS PLANT.**

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES,

PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF

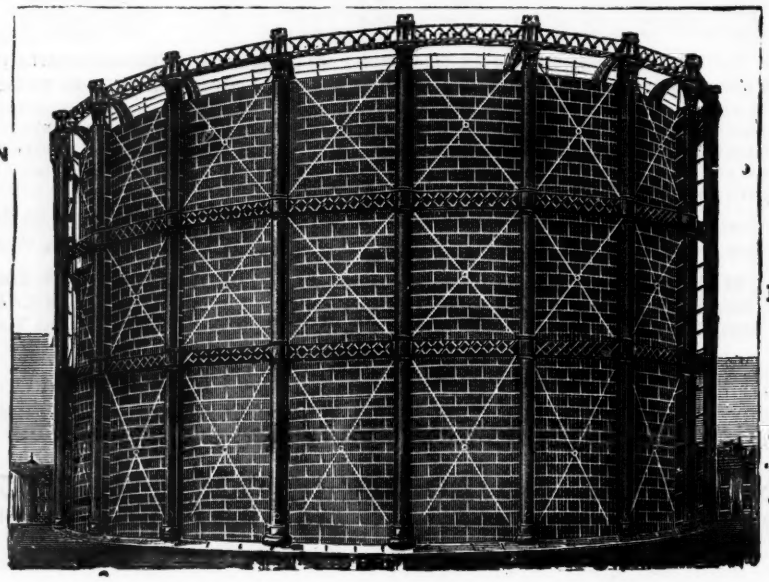
STRUCTURAL IRON

AND STEEL WORK,

BRIDGES

ROOFS,

PIERS, ETC.



WORKS AND HEAD OFFICE:
TIPTON,
STAFFORDSHIRE.

LONDON OFFICE:
11, VICTORIA ST.,
WESTMINSTER.

TELEGRAPHIC ADDRESSES:
"HORSELEY, TIPTON."
"GALILEO, LONDON."

THE DAVIS GAS-STOVE CO., LTD.,

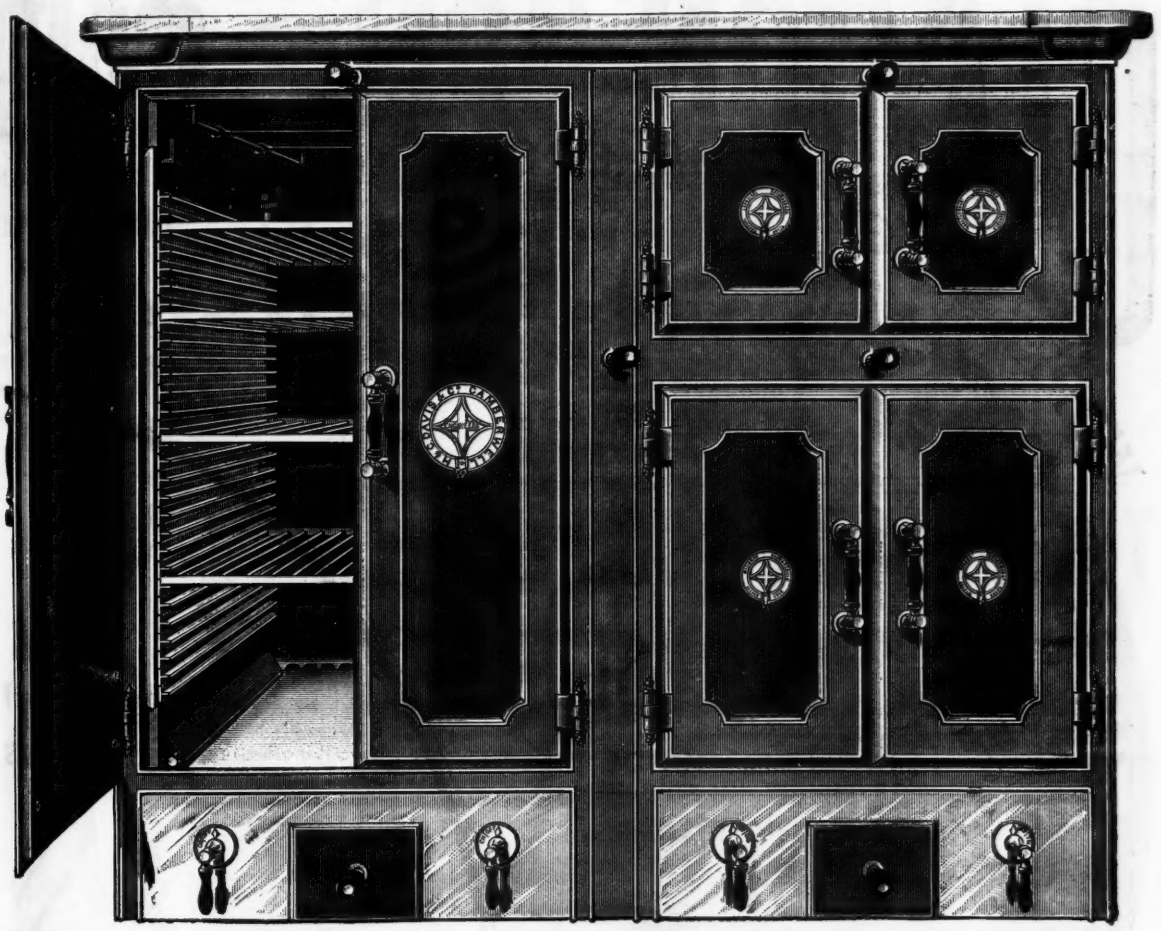
MANUFACTURERS OF LARGE

GAS COOKING APPARATUS

SUITABLE FOR

Hospitals, Asylums, Unions, Infirmaries, Schools, &c.

ENAMELLED ROASTERS, with HOT CLOSET. Nos. 3233 R & 3435 R.



		Large Roaster.			Bottom Roaster.			Top Roaster.		
		HEIGHT.	WIDTH.	DEPTH.	HEIGHT.	WIDTH.	DEPTH.	HEIGHT.	WIDTH.	DEPTH.
No. 3233 R	Inside	4 ft. 8 in.	2 ft. 9 in.	2 ft. 0 in.	2 ft. 8 in.	2 ft. 9 in.	2 ft. 0 in.	1 ft. 6 in.	2 ft. 9 in.	2 ft. 0 in.
	Outside	5 ft. 6 in.	3 ft. 1 in.	2 ft. 4 in.						

Dimensions over all: 5 ft. 6 in. high by 6 ft. 2 in. wide by 2 ft. 4 in. deep. **Price £75.**

No. 3435 R	Inside	4 ft. 8 in.	2 ft. 9 in.	2 ft. 6 in.	2 ft. 8 in.	2 ft. 9 in.	2 ft. 6 in.	1 ft. 6 in.	2 ft. 9 in.	2 ft. 6 in.
	Outside	5 ft. 6 in.	3 ft. 1 in.	2 ft. 10 in.						

Dimensions over all: 5 ft. 6 in. high by 6 ft. 2 in. wide by 2 ft. 10 in. deep. **Price £85.**

IF FITTED WITH PYROMETERS, £7 10s. Extra.

WRITE FOR CATALOGUE AND LIST OF INSTITUTIONS SUPPLIED.

FACTORY & OFFICES: CAMBERWELL. Show-Rooms: 59, QUEEN VICTORIA STREET.

All Communications to Camberwell.

HEATHCOTE GAS COAL.

RICH IN ILLUMINATING POWER AND YIELD OF GAS.
ABOVE THE AVERAGE IN WEIGHT AND QUALITY OF COKE.
MAINTAINS A HIGH STANDARD IN RESIDUALS.

THE GRASSMOOR Co., Ld., CHESTERFIELD.

CLAYTON SON & Co LTD

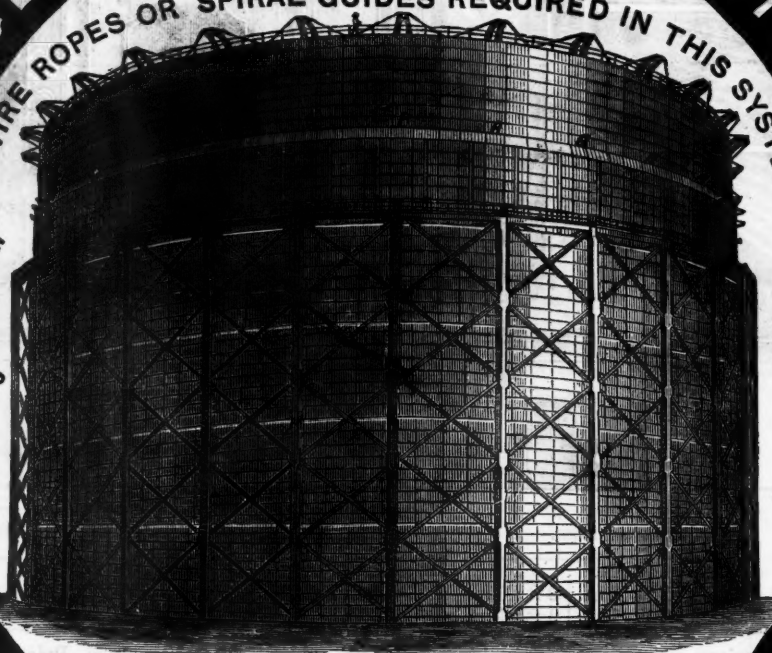
MAKERS OF

WORKS LEEDS

THE LARGEST GASHOLDER IN THE WORLD.

GASHOLDERS OUR SPECIALITY

NO WIRE ROPES OR SPIRAL GUIDES REQUIRED IN THIS SYSTEM.



INFINITELY SAFER AND FAR LESS COSTLY THAN ROPES OR SPIRAL GUIDES.

CAPACITY 12 MILLION CUBIC FT.

ERECTED AT EAST GREENWICH FOR THE South Metropolitan Gas Company
IT HAS SIX LIFTS 30 FT DEEP EACH AND IS 300 FT DIAM.

MAKERS OF GAS PLANT OF EVERY DESCRIPTION
ROOFS PURIFIERS &c. ALSO

ADDRESS LONDON 60, QUEEN VICTORIA ST.
TELEGRAPHIC "GAS, LEEDS.
GASHOLDERS OF ANY SIZE

ERECTED & COMPLETED WITHIN 12 MONTHS AND AT THE TIME SPECIFIED

ALEX. C. HUMPHREYS, M.E.,
General Superintendent & Chief Engineer,
The United Gas Improvement Company, U.S.A.

A. G. GLASGOW, M.E.,
Late General Inspector,
The United Gas Improvement Company, U.S.A.

HUMPHREYS & GLASGOW,

Contracting Engineers for Water Gas Plant,
9, Victoria Street, London, S.W.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE MARK.	TELEGRAMS:	LONDON AGENTS:
CXC	"JACKSON"	BECK & Co.,
	CLAY CROSS.	130, ST. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms—

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM	PRESCOT.	SOUTH SHIELDS
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

JONAS DRAKE & SON,

LONDON OFFICE:
60, QUEEN VICTORIA ST., E.C.

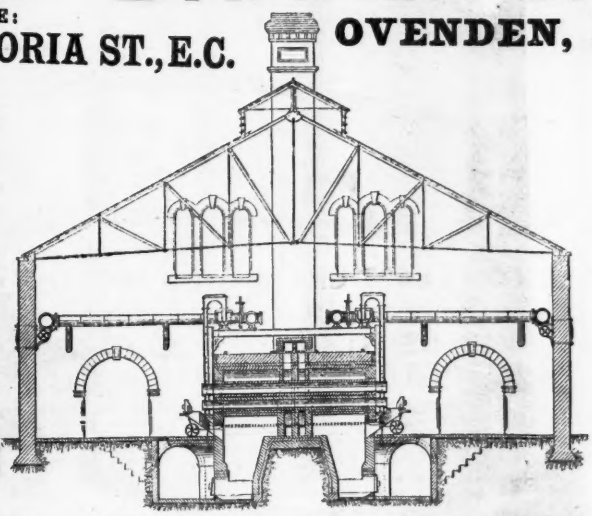
OVENDEN, HALIFAX.

TELEGRAPHIC ADDRESSES:
"DRAKESON, HALIFAX."
"ECLAIRAGE, LONDON."

TELEPHONE No. 43.
HALIFAX EXCHANGE.

GAS ENGINEERS,
CONTRACTORS,
IRONFOUNDERS,

BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



RETORT SETTERS,
FURNACE BUILDERS
ETC., ETC.

EGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S, VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

INCLINED RETORTS

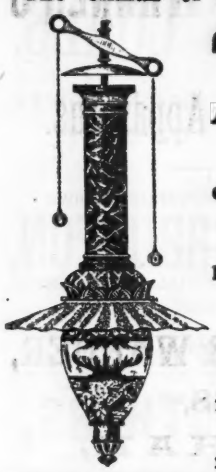
GASEOUS FIRING A SPECIALTY.

RETORT SETTING IN ALL ITS PRINCIPLES AND BRANCHES. BENCHES FITTED UP COMPLETE.
DRAWINGS, SPECIFICATIONS, AND ALL OTHER PARTICULARS ON APPLICATION.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

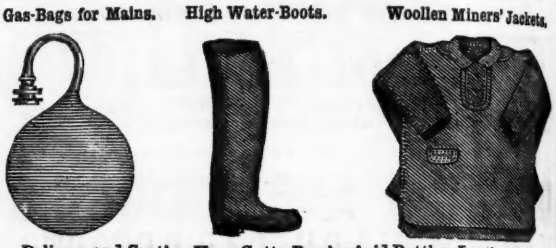
The Climax of Regenerative Gas Lighting!!



THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— 55/-
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England by
HENRY GREENE & SONS,
153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.

WILSON CARTER & PEARSON,
GAS COAL AND CANNEL FACTORS,
Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.
ADDRESS CHIEF OFFICES:
Temple Buildings, 50, New Street, Birmingham.

Gas-Bags for Mains. High Water-Boots. Woollen Miners' Jackets.



Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. 6d. per dozen.

Write for Price List to
THOMAS BUGDEN, Manufacturer,
71, GOSWELL ROAD, LONDON, E.C.

FOR **TUBES AND FITTINGS** APPLY TO
JOHN BROTHERTON, LTD., IMPERIAL TUBE WORKS, WOLVERHAMPTON

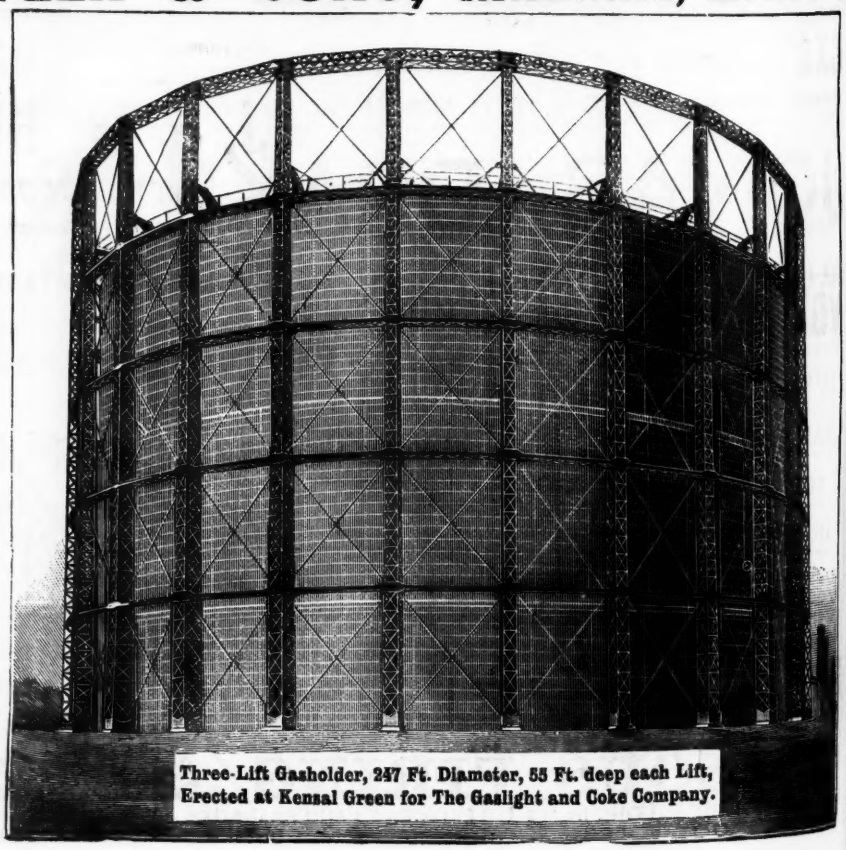
SAML. CUTLER & SONS, MILLWALL, LONDON.

NEARLY

8 MILLION

CUBIC FEET

CAPACITY.



Three-Lift Gasholder, 247 Ft. Diameter, 55 Ft. deep each Lift, Erected at Kensal Green for The Gaslight and Coke Company.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

ARROL-FOULIS

Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

See Illustrated Advertisement, p. II. Centre of JOURNAL for May 1.

THE DEIMEL GAS-LAMP.

Absolutely the Cheapest, Simplest, and most Economical Lamp before the Public.

Suitable for Suspension, or can be fixed to the ordinary Bracket in place of Burner.

Price of **Bracket Lamp, from 13s.**

Price of **Suspension Lamp, from 21s.**

Consumption 6 and 9½ cubic feet respectively.

Proprietors: THE DEIMEL LIGHT COMPANY, LIMITED,

"Deimel House," HATTON GARDEN, E.C. Works: Portpool Lane.

LIBERAL DISCOUNT TO GAS COMPANIES.

VOLCANIC FIRE CEMENT

(WINKELMANN'S).

In Use in more than **200** British Gas-Works.

Heat Resistance, 4500° Fahr.

Directions for Use, and all Particulars, sent post free.

PACKED IN CWT. BAGS.

DEPOTS AT

LONDON, STOKE-ON-TRENT, BIRMINGHAM, MANCHESTER, and GRIMSBY.

ANDREW STEPHENSON,

182, Gresham House, Old Broad Street, LONDON, E.C.

Telegrams: "Volcanism, London."

STOURBRIDGE RETORTS AND FIRE-BRICKS.

BEST QUALITY.

KING BROTHERS, STOURBRIDGE.

[See Illustrated Advertisement, May 1, p. 785.]

SHAW CROSS CANNEL & GAS COALS.

RICH IN YIELD OF GAS & ILLUMINATING POWER.

HIGH-CLASS IN QUALITY AND QUANTITY OF COKE.

For Analyses and Prices, apply to

CRAWSHAW & WARBURTON,

Coal and Cannel Proprietors,

DEWSBURY, YORKSHIRE.

CROWTHER BROTHERS,

Contractors for the Erection of Gas-Works Complete, RETORT-SETTINGS, Furnace Building, the Erection of Retort-Benches, &c., &c.

N.B.—Special attention given to the Erection of Inclined Retort-Benches on the Generator and Regenerative Principles complete.

MAIN LAYING IN ALL ITS BRANCHES.

For Terms and Particulars, apply to

CROWTHER BROTHERS,

152, Teviot Street, St. Leonard's Road, POPLAR, LONDON, E.

Telegraphic Address: "GASRETORT, LONDON."

Experienced Retort Setters and Main Layers sent to all Parts on the Shortest Notice.

J. & W. HORTON

ETNA WORKS,

SMETHWICK,

NEAR BIRMINGHAM

(Established 50 Years),

PATENTEES

AND

MANUFACTURERS

OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus,

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

CONTRACTORS TO HER MAJESTY'S GOVERNMENT, THE INDIAN GOVERNMENT, THE TURKISH GOVERNMENT, THE LONDON COUNTY COUNCIL, AND MANY LOCAL AUTHORITIES.

Crosbie's Manufactures have been supplied to the following Local Authorities and Gas and Water Works:—

Aberdovey, Abergavenny, Aldridge, Antrim, Armagh, Ascot, Ballymena, Beaumaris, Bentham, Birmingham, Bognor, Bramham, Brandon, Broadstairs, Bromsgrove, Builth, Burton, Castleford, Carlow, Chesterton, Clitheroe, Cobham, Coleshill, Colombo, Coventry, Cranbrook, Cullen, Dewsbury, Downpatrick, East Ardsley, Eastbourne, Elland, Ellesmere, Eye, Farnham, Felixstowe, Garston, Gillingham, Gorey, Halesowen, Hanley, Hendon, Hinckley, Honiton, Huntingdon, Ilkeston, Irthlingboro', Kegworth, Kildwick, Kilrush, Kirkburton, Knutsford, Leamington, Leek, Leven, N.B., Limerick, London, Lymington, Merthyr Tydvil, Milborne Port, North Middlesex, Penmaenmawr, Pembroke, Portadown, Portrush, Portsmouth, Raunds, Ramsey, Richmond, Rochester, Roscommon, Rugeley, Scarborough, Seaham Harbour, Seisdon, Shipston-on-Stour, Skibbereen, Slough, Southend, Stafford, Stamford, Stroud, Sudbury, Swinton, Tokio, Uppingham, Uttoxeter, Ventnor, Warwick, Wexford, Wigston, Witney, Wolverhampton, Workington

CROSBIE'S PAINTS.

GUARANTEED GENUINE AND FREE FROM ADULTERATION.

GUARANTEED GENUINE AND FREE FROM ADULTERATION.

CATALOGUE AND TESTIMONIALS ON APPLICATION.

ADOLPHE CROSBIE, LTD.,

Colour Works, WOLVERHAMPTON.

CLAPHAM BROTHERS, LTD.,

— ESTABLISHED 1837 —

Sole Makers of Laycock and Clapham's

PATENT "ECLIPSE" WASHER-SCRUBBER.

Constructed on a **PRINCIPLE** which has **PROVED MOST EFFICIENT**, and **NOT REQUIRED IMPROVING**, giving the **LARGEST AMOUNT OF FRESHLY WETTED SURFACE** of any machine yet introduced.

68 Machines, with a total Capacity of 76,100,000 Cubic Feet per day, have been supplied, or are in course of erection.

Last year the Manchester Corporation put in an "ECLIPSE" WASHER-SCRUBBER to pass 3,000,000 Cubic Feet per day; and this year have ordered **TWO MORE, each to pass 4,000,000 Cubic Feet per day.**

OTHER LARGE REPEAT ORDERS HAVE ALSO BEEN RECEIVED.

CLAPHAM'S IMPROVED VALVES, PURIFIERS, AND RETORT-FITTINGS; MAINS, AND GENERAL CAST AND WROUGHT IRONWORK.

CATALOGUES AND FULL PARTICULARS ON APPLICATION.

Wellington, Nelson, and Market Street Works, KEIGHLEY, YORKS.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, May 8, 1894.